

American Foundryman

Houston AFS Convention
PREPRINT REQUEST CARD
Page 51

APRIL
1955

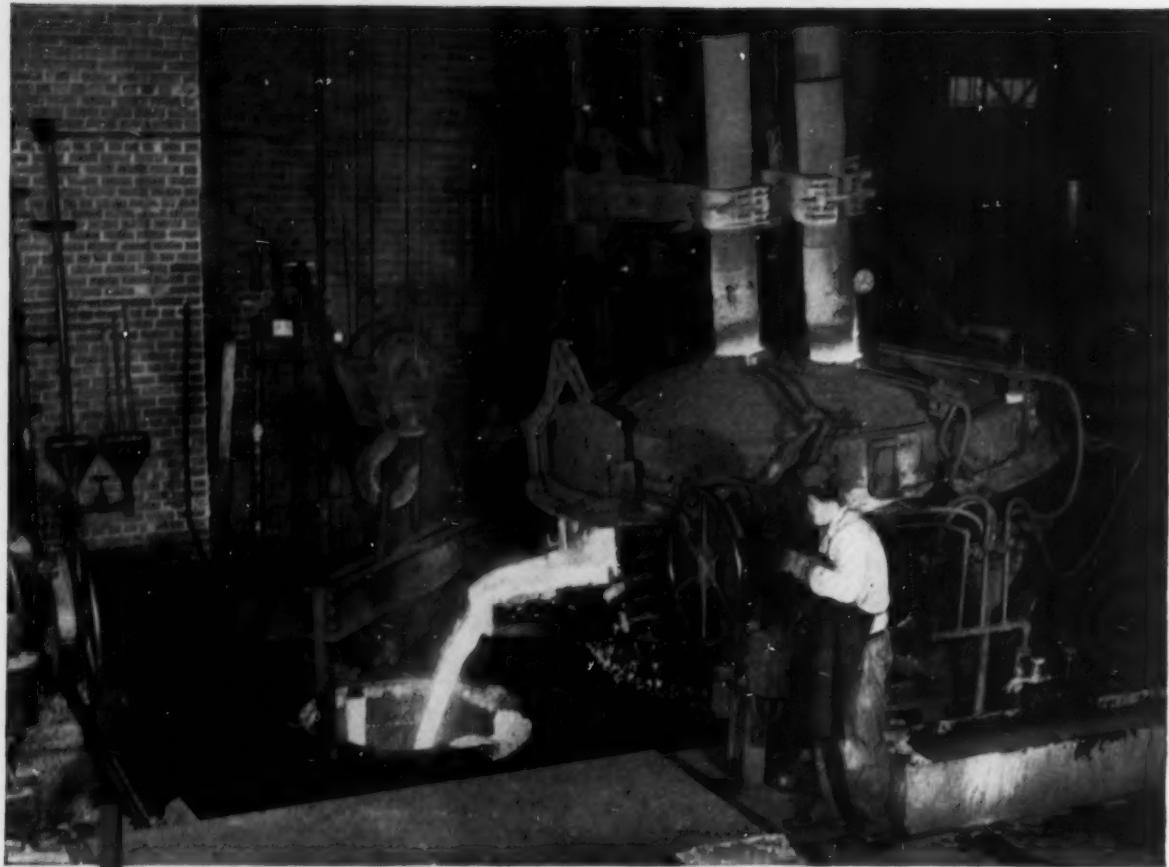


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The Foundryman's

Own
Magazine





31-year-old Lectromelt Furnace still hard at work for Dibert, Bancroft and Ross Co., Ltd. of New Orleans, manufacturers of sugar mill machinery, dredge boat machinery and electric steel castings.

"31-year-old Furnace performs like new"

"After 31 years of trouble-free service this Lectromelt* C-18 Furnace looks only a year old. It performs as well as when installed, turning out 8-ton heats in three hours."

Today's Lectromelt Furnaces are masterpieces of engineering compared to this C-18. And you get even greater durability and dependability.

New Lectromelts, of course, are top-

charged to save manpower, speed production, cut electrode consumption and give you added lining life. Power supply and power regulation equipment is specially engineered to fit your installation.

Write for Catalog No. 9, or ask to have an engineer call to discuss your requirements: Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in . . . GERMANY: Friedrich Kocks GMBH, Dusseldorf . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT...

MOORE RAPID

Lectromelt

For more facts, circle No. 171 on postage-free Reader Service card on p. 17 or 18





"beat" LUMPY SHAKEOUT with **FEDERAL** **SAND** **STABILIZER**

Taking a "thumping" from lumpy shakeout? Don't worry! There's a sure way out! Adding Federal SAND STABILIZER (a processed cellulose sand additive) to your sand, dry or in slurry, will give you a better, less lumpy shakeout, *without* adding other clays to your sand mixture. For, among the many advantages afforded by this highly efficient sand additive is its ability to eliminate lumps in sand shakeout and improve core knockout.

In addition to improving shakeout, you'll find, during the pouring period, that Federal SAND STABILIZER burns out at a much faster rate than any other type of facing material. Since it has a very low ash content and has no deteriorating effect on sand, the re-use of your molding sand can be practiced with *complete safety*.

Federal SAND STABILIZER greatly improves the flowability of sand, too—providing much better ramming conditions. When added to facing or backing sand, more uniformly rammed mold surfaces will be obtained, thus providing smoother casting finish. When added to bentonite slurry, STABILIZER sharply reduces viscosity of solution, permitting the addition of more bentonite to the slurry for greater strength, if desired.

Yes, Federal SAND STABILIZER can be a big help to you! Especially so, if used along with Federal's CROWN HILL SEACOAL—the low sulphur seacoal, and GREEN BOND BENTONITE—the long-lasting bentonite. These three outstanding sand additives will really give you easy, uniform, *thoroughly dependable* sand control. To learn more about them, write for Federal's bulletin: "Tailor-Made Molding Sands".

FEDERAL

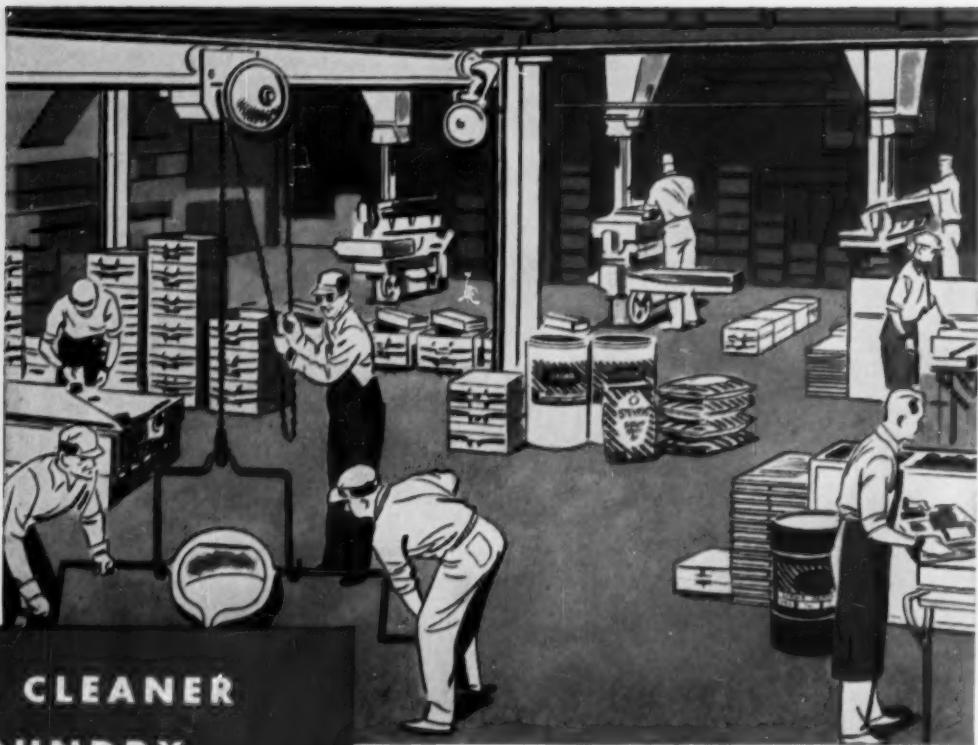
If you have "lumpy shakeout" — use Federal SAND STABILIZER!



The FEDERAL FOUNDRY SUPPLY Company

4600 EAST 71st STREET, CLEVELAND 5, OHIO

CROWN HILL SEACOAL • CHICAGO • DETROIT • MILWAUKEE • RICHMOND, VA • ST. LOUIS • CHATTANOOGA • NEW YORK • UNION, WYO.



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FOUNDRY
OPERATIONS . . .**

Cleaner foundries, the goal of foundrymen everywhere, mean better and healthier working conditions and improved employee relations. Cleanliness contributes, too, toward another goal of foundrymen—increased, more efficient production at lower costs. As contributions towards attaining these goals, Stevens offers these proved products:

- **STEVENS KLEENAIR SEACOAL—STEVENS KLEENAIR KING KORE COMPOUND**—These basic products, Seacoal and Pitch Compound, have been treated to make them dustless. Dust has been reduced to a small fraction of the amount created by ordinary Seacoal and Pitch.
- **STEVENS SNO-WHITE NON-SILICA PARTING**—Contains less than one half of 1% silica, making it safe to use. It is clean because it is pure white.

**. . . CHECK THESE
STEVENS PRODUCTS**

- **STEVENS TRI-COTE CORE WASH—STEVENS EMERALD CORE WASH**—Being in paste form, these core washes are dustless in handling and in mixing.
- **STEVENS SLICK-SEAL MUDDING COMPOUND**—A paste type, ready to use product that creates no dust. Can be washed from the hands in plain water.
- **STEVENS #115, #125 AND NEW YELLOW JACKET CORE WASHES**—are clean to use because they are light in color.

For a cleaner foundry, consider using these Stevens products. Order trial quantities today or write direct for Technical Bulletin F-128, "Quick Steps to Cleanliness in the Foundry."

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INDUSTRIAL CHEMICALS

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Metal Finishing equipment and supplies from castings or stampings to finished product

For more facts, circle No. 175 on postage-free Reader Service card on p. 17 or 18

American Foundryman



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Melting control at the Belle City Malleable Iron Co., Racine, Wis., begins with careful checking of melt materials as described by Frank L. Lopour in "Malleable Duplexing Melting Control" on pages 38-39.

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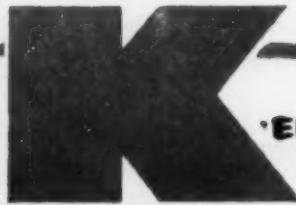
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SITUATION UNDER CONTROL

BY KEOKUK



KEOKUK



ELECTRO-METALS COMPANY

KEOKUK, IOWA

WENATCHEE DIVISION, WENATCHEE, WASHINGTON

Smoke out high costs and control quality with Keokuk Silvery Pig Iron! Keokuk assures less waste and exact control of the melt through uniform silicon distribution. Car for car, pig for pig, its uniformity never varies. Charge Keokuk by magnet or count.

Keokuk Silvery . . . the superior form of silicon introduction for steel plants and foundries . . . available in 60 and 30 lb. pigs and 12½ lb. piglets . . . in regular or alloy analysis. Keokuk also manufactures high silicon metal.

Keokuk Silvery . . . the superior form of silicon introduction for steel plants and foundries . . . available in 60 and 30 lb. pigs and 12½ lb. piglets . . . in regular or alloy analysis. Keokuk also manufactures high silicon metal.

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332 S. Michigan Ave., Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio
8230 Forsyth Blvd., St. Louis 24, Missouri

Tips, Trends & Techniques

Patterns Cast to Size Cost Less.....p. 34

Drastic reduction in pattern cost is made when gray iron patterns are cast in precise, zircon sand core molds. Unconventional shrink allowance and dense mold gives pattern casting virtually ready for use, requiring only 1/5 to 1/8 the usual finishing time. Pattern surfaces, other than those machined for mounting, are finished with emery cloth wrapped around small tool inserted in small air grinder.

On-the-Job Melting Supervision.....p. 38

Cupolas melting for air furnace duplexed malleable in a mechanized foundry must be operated under variable conditions: wide change in rate of metal demand . . . change in coke quality . . . variation in physical condition of scrap and sprue . . . delays due to equipment maintenance. A good melting supervisor anticipates and evaluates the effect of these variations.

Vapor Holes in Brass and Bronze.....p. 40

Pouring copper-base alloys of maximum density without vapor holes due to sand grains demands mold cleanliness and a compromise pouring temperature. A perfect sand mold with no loose sand should permit metal to be poured as low as 1800 F.

Workable Bottom-Pour Ladle Practice.....p. 43

Switch from acid to basic electric steel practice called for thorough study of ladle lining erosion factors. Result is development of double lining of low-cost materials that is safer, faster to install, gives 70 F increase in pouring temperature.

Flexible Boxes for Plaster Cores.....p. 46

Plaster cores for internal and external surfaces of aluminum alloy castings can be made without draft, even with back draft, if the core box is lined with flexible rubber-like material. Such

boxes not only eliminate loose pieces but are also economical, accurate, and easily duplicated.

AFS Convention Preprint Request Form.....p. 51

Preprints of AFS Convention papers to be presented May 23-27 in Houston that are available on request are listed on page 51 along with a convenient postpaid card. Abstracts of Convention papers start on page 54.

Cast Water in Transparent Molds.....p. 56

Study of water flow in transparent plastic molds led the way to raising level of stress-rupture properties and narrowing spread of results of investment-cast specimens. Method works for turbine buckets made by investment casting too.

Risers for Sound Ductile Iron.....p. 62

Riser dimensions and feeding distance data show how to calculate risers that will prevent centerline and riser-neck shrinkage. Reduced to a graph, data on a number of geometric shapes of different sizes gives founders of ductile iron quantitative method of determining adequate side blind risers.

Semi-Automatic Muller Control.....p. 67

Maintenance man constructed air-operated electrically-controlled system that takes sand mixer through mulling and discharge, freeing operator for other duties and giving better control over sand properties.

Melting Furnace Emission Control.....p. 69

Nature of material emitted by melting furnaces, particle size, and typical data on a variety of units, are given in a data sheet that condenses part of the valuable information accumulated by the foundry industry in its role as a leader in elimination of unhealthful dusts and fumes from working areas of industrial plants.



AJAX LO-VEYORS BUILT INTO MODERN FOUNDRY SYSTEM

Photograph shows typical arrangement of Ajax Lo-Veyors with motor driven reciprocating drive mounted below.

Elimination of exposed bearings reduces maintenance cost of Ajax Lo-Veyors particularly under foundry conditions where abrasive sand is encountered.

Ajax Lo-Veyors are available in a wide range of lengths and capacities to fit every condition.

Rivers of foundry sand flow from shakeouts to tumblers to dryers on Ajax Lo-Veyors. Tonnage is measured in thousands. Around-the-clock operation is building new production records.

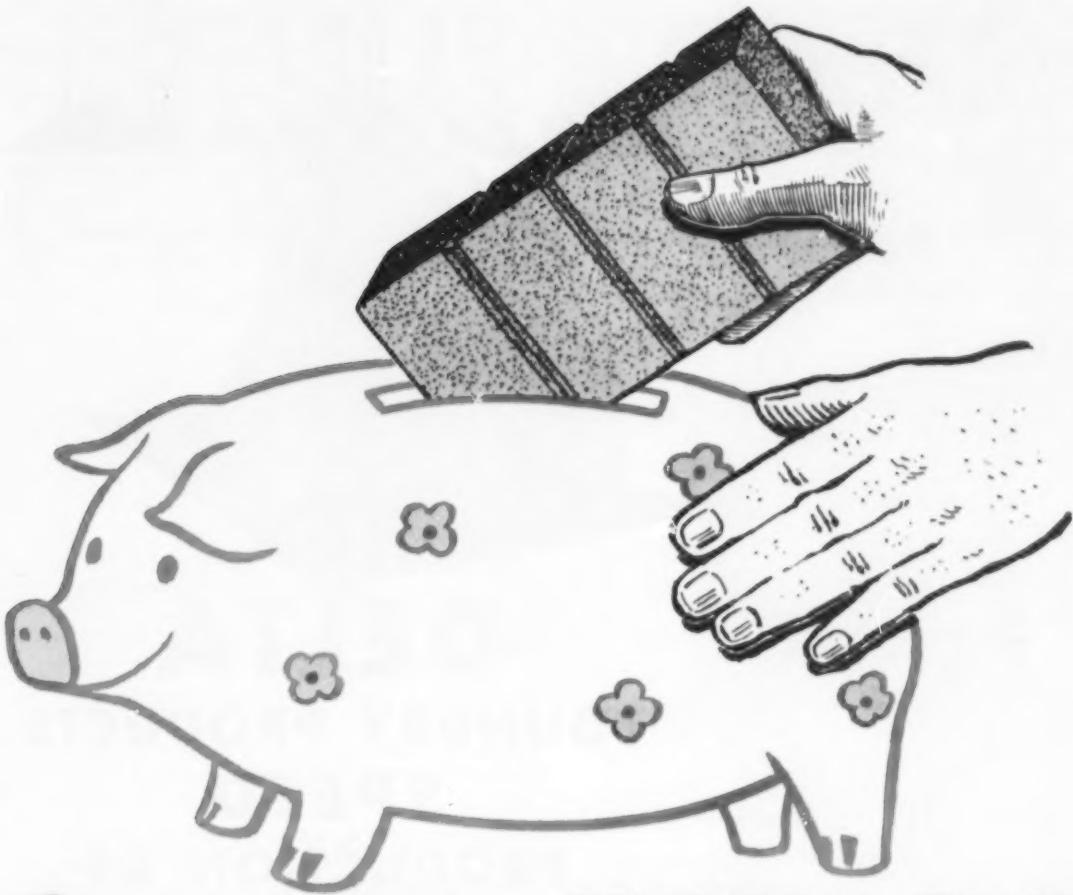
The photograph shows just a small part of this new ultra-modern automotive foundry equipped with Ajax Lo-Veyors.

They are cutting costs in conveying, separating and screening foundry sand. Whether you are an original equipment manufacturer, a captive or custom foundry, . . . look into the performance, reliability and economy of Ajax Lo-Veyors.

Write for Bulletin 39 right now.

AJAX FLEXIBLE COUPLING CO. INC.
Westfield, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES



Famous CORNELL CUPOLA FLUX puts money in the bank

...because it increases the amount of slag that floats off by causing a chemical reaction in molten iron. Drops are cleaner thereby saving you hundreds of dollars in digging out time. Castings have greater tensile strength and are uniformly hard throughout. Anyway you look at it, Famous Cornell Cupola Flux puts money in the bank for you by improving the quality of your gray iron castings and saving you production time.

How To Use Famous Cornell Flux
 Famous Cornell Flux is made in easy-to-handle brick form. With each charge of iron, you simply toss one brick into the cupola. For charges less or more than a ton, just break off a proportionate number of scored sections. Famous Cornell Flux is the easiest and most economical way to insure that the metal that goes into your castings is free from foreign matter, a primary cause of casting rejects.

Contact your nearest Cornell engineer. Or write for Bulletin 46-B.

8 Advantages of Famous CORNELL

Aluminum and Brass Flux

- Makes metal pure and clean.
- Permits use of more scrap without danger of dirt, porous places or spongy spots.
- Thinner, yet stronger sections can be poured.
- Metal does not cling to the dross.
- Crucible or furnace linings are kept clean and preserved.
- Cleanses molten brass even when the dirtiest brass turnings or sweepings are used.
- Saves considerable tin and other metals.
- Forms a perfect covering over the metal during melting, prevents oxidation and reduces obnoxious gases to a great extent.

Write for Bulletin 46-A

The CLEVELAND FLUX Company

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Manufacturers of Iron, Semi-Steel, Malleable, Brass,
Bronze, Aluminum and Ladle Fluxes—Since 1918

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DELTA FOUNDRY PRODUCTS

CORE AND MOLD WASHES

FOR STEEL:

Delta Special Core and Mold Wash Base
Delta SteelKoat
Delta PyroKoat S

FOR ALL TYPES OF SAND CAST METALS:

Delta ThermoKoat
Delta Z-Koat
Delta Z-Z-Koat

FOR GRAY IRON, MALLEABLE, BRONZE AND BRASS:

Delta GraKoat
Delta BlackKoat
Delta DriKoat

FOR GRAY IRON:

Delta BlackKoat S-S

FOR NON-FERROUS AND LIGHT METALS:

Delta NonFerrousKoat

PARTING COMPOUNDS

Delta Partex
Delta Liquid Parting

MUDGING AND PATCHING COMPOUNDS

Delta Silktite
Delta Ebony

NO-VEIN COMPOUND

MOLD SURFACE BINDERS - LIQUID

Delta Spray Binders

PERMI-BOND

DRI-BOND (Dry Binder)

BONDITE BINDER

LIQUID RESINS AND BINDERS

Delta 155-X Fast-Dri
Delta 166-X Fast-Dri

96-B SAND RELEASE AGENT SAND CONDITIONING OIL

CORE ROD DIP OIL

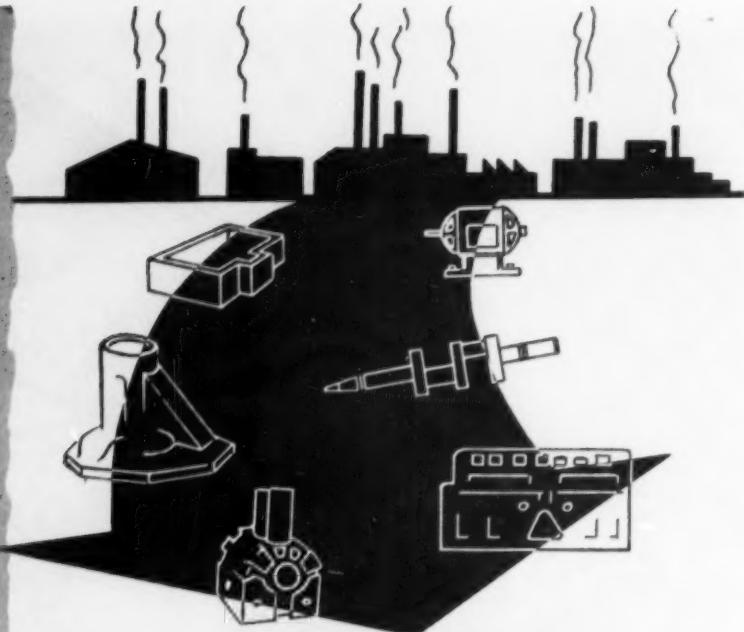
CORE OILS

DELTA-DIETERT PROCESS BINDER 103XX (For "D" process shell cores.)

DELTA

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS



DELTA FOUNDRY PRODUCTS

SPEED PRODUCTION OF BETTER, CLEANER CASTINGS

AT
lower cost

Every DELTA Foundry Product has been scientifically developed to provide more speed and greater economy in the production of finer-finished castings.

DELTA'S scientific control safeguards the higher quality and maintains the absolute uniformity of product so essential to consistently better results.

Get the Facts . . . Working samples and complete literature on Delta Foundry Products will be sent to you on request for test purposes in your own foundry.

MILWAUKEE 9,
WISCONSIN

VOLCLAY BENTONITE

NEWS LETTER No. 38

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE

Scabbing

The expansion scab is the breaking away of a portion or slab of the molding sand when hot metal enters the mold. The broken-away portion of the sand mixture adheres to the metal or is absorbed into it.

It is identified as a rough, slightly raised surface blemish, crusted over by a thin, porous layer of metal under which is a honey-comb or cavity that usually contains a layer of sand. The defect is common to thin-walled portions of the casting.

The boil scab appears as though the metal has been agitated or "boiled" on the surface. Erosion usually occurs and the sand is washed to another location on the casting.

Some of the old time molders attribute scabbing to insufficient local ramming of the mold whereby the weaker portion breaks away. Other old timers say it is due to faulty venting, caused by a part of the mold being wet or rammed too hard, or by agitation of the metal which left a solid mass of sand and metal at that spot.

The difference in the two opinions lies in the fact that some of the scabs appear to be solid, whereas others appear to be hollow. In ceramics, the word "scab" would probably be referred to as "spalling" which usually occurs with variations of volume change and thermal heat shock.

THE CHIEF SOURCE OF SCABS IS HIGH SAND EXPANSION, COMBINED WITH HIGH HOT STRENGTH. Five Star Wood Flour overcomes sand expansion. As little as 1% insures against scabs. Write for additional data on Five Star Wood Flour.

Photo Courtesy of: Bradley H. Booth



TWO FORMS—EXPANSION AND BOIL

Improper heating at the mold cavity in-gates may be the chief reason for the difference in thermal expansion of the sand. Hard or uneven ramming can bring about scabbing as can improper gating and pouring at temperatures that are too high.

Where metal splashes, squirts, or where a collision of metal waves cause a turbulence on the sand surface, a boil scab is likely to occur.

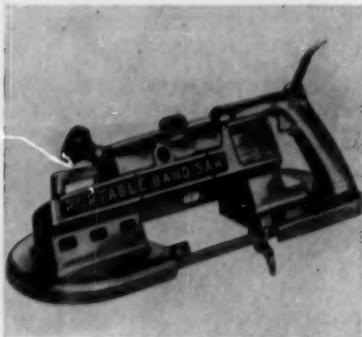
It is quite true that mold gases and vapors cannot penetrate wet or tight sand, and by detouring around this portion of sand, the vapor accumulates behind and thus forces the scab. Poor grain distribution or too-uniform sand encourages high sand expansion which results in scabs. Other causes of scabbing are low permeability, too much moisture, and excessive dry and hot strengths.

AMERICAN COLLOID COMPANY

Chicago 54, Illinois • Producers of Volclay and Panther Creek Bentonite

Products & Processes

Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20



▲ Portable Metal Band Saw

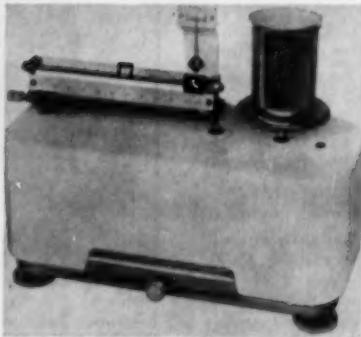
Electric metal-cutting band saw that is completely portable has been introduced. New model, known as the 524 Porta-Band Saw, weighs only 16 lb, is scarcely larger than a hand hack saw, and is 15 times faster by actual test. It is said to be the only metal-cutting saw made that is fast and light enough to be used free-hand in any position. The 524 with a stock-cutting capacity up to 3 1/4 by 4 1/4 in. is equal to a large hack saw. The band speed is 240 surface feet per minute under load. *Porter-Cable Machine Co.*

For more facts, circle No. 107 on p. 17

▼ Moisture Content Balance

An improved and redesigned balance for moisture determination has been announced. Known as Model DB-5, the new balance has a single calibrated stainless steel beam and a vernier slide weight, with coarse and fine adjustments, which allows the accurate determination of moisture in a 10 gm. sample, from 0.1 per cent to 100 per cent. Two additional slide weights are provided; one for taring of containers weighing up to 45 gm, the other to tare 2, 5, or 10 gm sample weights. *Torsion Balance Co.*

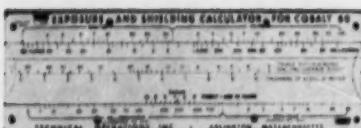
For more facts, circle No. 109 on p. 17



▲ Safety Switch

The purpose of the Dillon Dyna-Switch is to prevent overload damage to costly hoisting equipment by automatically cutting out lifting power whenever the safety maximum is exceeded. This is done by means of a massive U-shaped bar of high grade tool steel, heat treated to flex millions of cycles without losing its resiliency. Attached between the load and the hoist, it trips a sensitive microswitch whenever the bar is deflected beyond its pre-set operating point, thereby breaking the lifting circuit. *W. C. Dillon & Co., Inc.*

For more facts, circle No. 111 on p. 17



▲ Exposure Calculator

Complex mathematical computations involved in determining exposure times in gamma radiography are rapidly and easily accomplished with a new exposure calculator. With this slide-rule type calculator the many variables characteristic of any radiographic problem are quickly integrated into a single calculation. Provision is made for evaluating the type of film used, photographic density required, thickness of the steel specimen, source-to-film distance, and strength of the cobalt source. *Technical Operations.*

For more facts, circle No. 108 on p. 17

▼ Industrial Fans

Industrial fans formerly produced only as components of Dracco Dust Control Systems are now available. Fans have uses in all types of industrial air-handling applications. Standard designs may be utilized for a wide variety of substances: clean or dirty air, fumes, dust, refuse, shavings, or stringy material. Specialized fans are available for conveying explosives, gases up to 800 F, or materials of a corrosive nature. Sizes vary, inlet diameters are from 11 in. to 38 in. and capacities from 500 to 46,000 cfm. *Dracco Corp.*

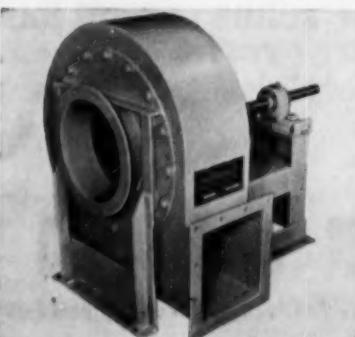
For more facts, circle No. 110 on p. 17



▲ Vibrating Screens

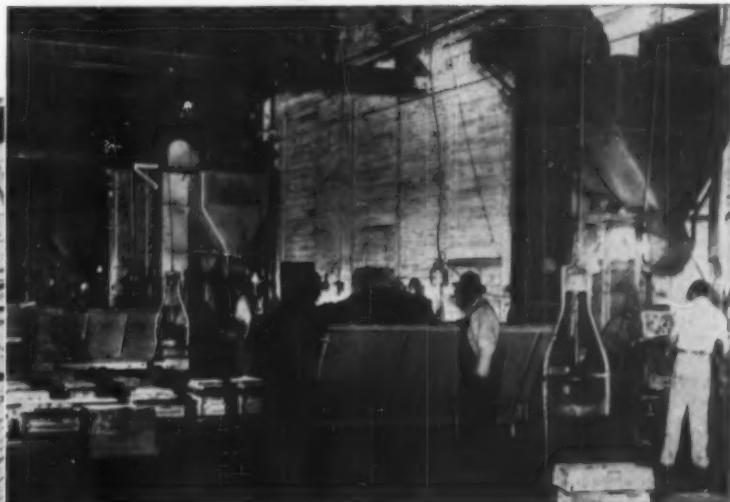
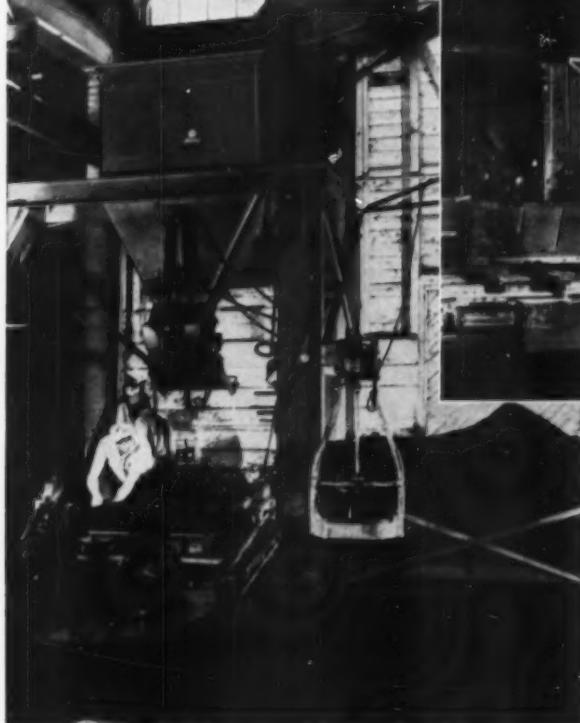
Recent advanced developments of electromagnetically operated equipment are included in the new features of the Syntron Vibrating Screens that will screen dry materials for industrial uses. The VS-series of screens are compact, lightweight and ruggedly constructed with dustsealed electromagnetic vibrators. Screen cloth tension is maintained at drumhead tightness by a fixed full width hook bar at the discharge end and an adjustable hook bar at the feed end of the screen cloth. *Syntron Co.*

For more facts, circle No. 112 on p. 17
continued on page 12



6 HANDY SANDYS save 48 hours per day and increase casting production

at Goldens' Foundry & Machine Company
Columbus, Georgia



A series of Twin Hopper Handy Sandys working over squeezer machines. Molds are set out on floor by helper for daily pouroff.

One of the Single Hopper Handy Sandys working on large rollover jobs. Castings range from 1 to 1000 lbs., and are used in power transmission products, cotton gin and general machinery industries.

"For a long time we had realized the value of having overhead sand in our Gray Iron jobbing foundry" says the Plant Engineer. "However, it was not logical or economical that we should install a complete sand system since we use several sand mixes in our various molding operations.

"We first became interested in Newaygo Equipment because of its adaptability to jobbing foundry work, and it also seemed to be the answer to our sand handling problem. In 1950 we ordered one Twin Hopper and one Single Hopper Handy

Sandy. They worked out very satisfactorily and in 1951 we reordered two more of each.

"These Newaygo Handy Sandys have been in operation for several years and have required very little maintenance. Casting production on the six floors served by the 3 Twin Hopper Handy Sandys remained about the same. Our big gain has been the savings of 48 man hours per day on these same floors. On the 3 Single Hopper Units we still use the same number of men for rollover work, however we are getting a definite increase in casting production.



Planned Mechanicalization for Foundries
is yours for the asking. Write,
wire, or phone

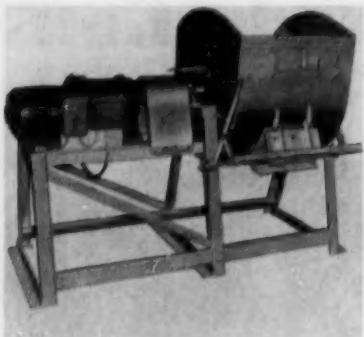
NEWAYGO

engineering company
NEWAYGO, MICHIGAN

Manufacturers of Newaygo Sand Handling, Sand Handling and Conditioning Equipment

Products & Processes

continued from page 10

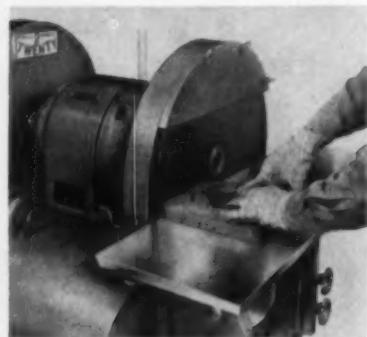


▼ Steam Operated Vibrator

New steam operated vibrator has been added to the line of patented noiseless Vibrolators made by Martin Engineering Co. New Vibrolator, called the SDV-35, can be used on many industrial applications where wet or dry materials must be moved by induced vibration. Many industries find the SDV-35 an important new tool because they can use steam already available for use in the manufacturing process or as a by-product. When used with steam, a return steam line keeps exhaust vapor confined. *Martin Engineering Co.*

For more facts, circle No. 115 on p. 17

Fill out postcards on
pages 17-18 for complete
information on items listed
on pages 10-12-17-18-20



▲ Sand Mixer

New sand mixer designed for service in foundries is a recent development of McLanahan and Stone Corp. With a capacity of five cu. ft. of sand, the unit completes the mixing process in three minutes. Mixer is self-contained and powered by a three hp electric motor. Design is such that the mixing process is always in view, and test samples can be taken at any time. Mixing box is lined by three $\frac{1}{4}$ in. high carbon plates. Mixing is accomplished by four flanged paddle arms holding mixer blades. *McLanahan & Stone Corp.*

For more facts, circle No. 113 on p. 17



▲ Cloth Disc Grinder

Through the development of a special method of processing abrasive coated cloth discs a grinder which operates at a perimeter speed of more than 18,000 fpm, has been produced. Known as the Neeco-2-Twenty Abrasive Coated Cloth Disc Grinder, the new unit is a 20-in. diameter double disc machine. It is powered with a special 10 hp motor, fully adequate to handle heaviest material removal loads without reducing disc speed. It is supplied in 220 or 440 volts, 60 cycle. *New Era Engineering Co.*

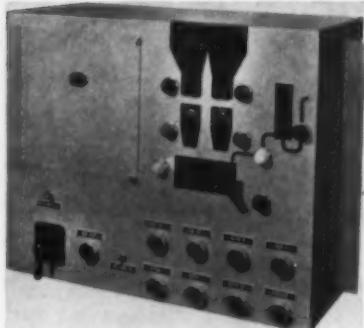
For more facts, circle No. 117 on p. 17



▼ Vertical Contact Adapter

New auxiliary equipment to materially increase inspection rates without obsoleting existing units has been announced. Known as the X-1584 Vertical Contact Adapter, it is really a special jig. It fits any standard horizontal Magnaflux unit. Almost no installation is required, and once installed it can be connected or disconnected in two to five minutes. The X-1584 is complete. It comes with quick disconnect air hoses. Cables and attachments for magnetizing current are provided. *Magnaflux Corp.*

For more facts, circle No. 116 on p. 17



▲ Motorized Wheelbarrow

New motorized wheelbarrow, termed the Workhorse, promises to be a welcome piece of equipment on any job where pig iron, scrap, sand, patterns or castings have to be transported. Utilizing an easy-to-start 4-cycle, 2½ hp motor mounted on supports behind the tray, the Workhorse can carry a full, 400-lb load up a 16 per cent grade without hesitation and very little effort by the operator. Throttle and clutch controls are located on the wheelbarrow handles, making starting and speed control easy. *Worthington Mower Co.*

For more facts, circle No. 114 on p. 17



▲ Automatic Cycling System

Illustrated above is a console cabinet housing a timer and components of an automatic cycling system for a batch type sand mixer supplied by two Batch Hoppers. Operations controlled by the Dietert-Detroit Automull are: sand bin discharges into hopper, hopper discharges into mixer, water into measuring tank, water discharge from tank into mixer, bond hopper discharge into mixer, mixing time, sand discharge from mixer and total cycle time. *Harry W. Dietert Co.*

For more facts, circle No. 118 on p. 17
continued on page 17



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LET'S FACE THE FACT . . . in the Gray Iron industry, you are in a highly competitive business. You are in competition with other materials and methods . . . in competition with other foundries.

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Silicomanganese Alloys Ferromanganese Briquettes

These two versatile Manganese alloys, members of the Vancoram family of products, were each carefully developed to help steel and iron makers produce metals of the highest quality with maximum efficiency.

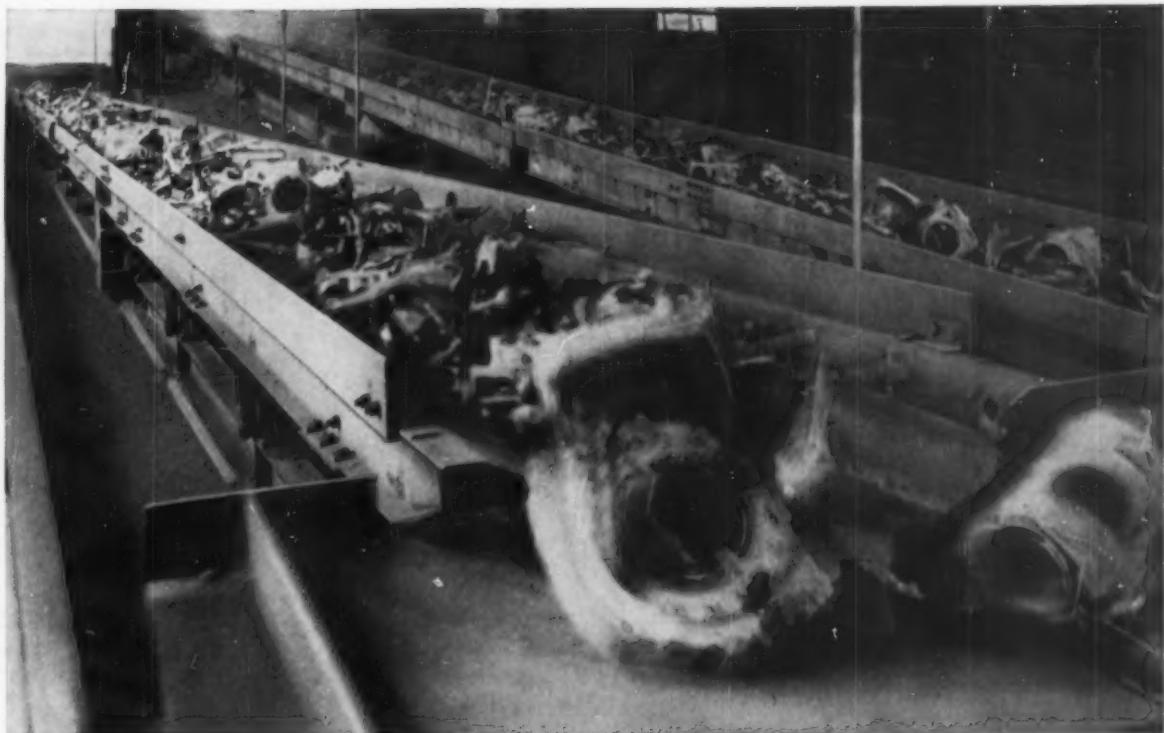
VANCORAM SILICOMANGANESE ALLOYS, available in three grades, are valuable additions to both steel and cast iron . . . serving as a furnace block, deoxidizer, desulphurizer and source of manganese. These alloys are noted for their purity and uniformity of composition.

Carbon	Manganese	Silicon
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2.00% max	65/68%	15/17.5%
3.00% max	65/68%	12/14.5%

VANCORAM FERROMANGANESE BRIQUETTES are recommended for use in iron as a manganese addition agent and also as a desulphurizer. Their shape is oblong for swift identification, their weight is approximately 3 pounds per briquette for easy handling, and their manganese content is exactly 2 pounds for simple addition without weighing.

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Whether you make your additions to furnace, cupola or ladle . . . you'll consistently get better, more uniform results when you use Vancoram Silicomanganese Alloys or Vancoram Ferromanganese Briquettes.



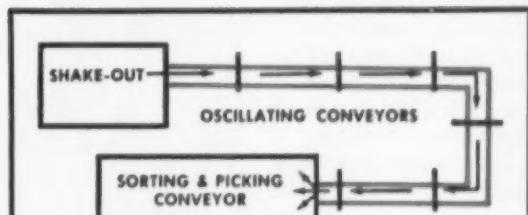
Large foundry mechanizes with 1650 ft. of **LINK-BELT** Oscillating Conveyors

Trouble-free system has capacity for cooling 400,000 tons of gray iron castings annually

PLANNING with this foundry's engineers, Link-Belt specialists found that the best cooling arrangement involved gentle movement of castings by oscillating conveyors up a 5-degree incline from shakeout to sorting. They designed a system of Link-Belt oscillating conveyors which permits continuous material flow . . . has brought safer, cleaner working conditions in the bargain. What's more, this gentle handling has eliminated damage to castings experienced in other types of conveyors in discharging from one unit to another.

Better cooling of castings on oscillating conveyors is but one phase of foundry engineering and equipment pioneered by Link-Belt. Our engineers can plan an entire conveying and sand preparation system for you . . . and follow through with a complete line of quality equipment to help you produce better castings at lower cost.

Whether you need one machine or complete engineering, call your nearest Link-Belt office. Be sure to inquire about stock availability of standardized sections of 36-in. oscillating conveyors, that cut both costs and delivery time. Also, get Book 2423 for complete information on Link-Belt's broad line of foundry equipment.



Layout of typical foundry oscillating conveyor application

AT LARGE MIDWEST FOUNDRY, gray iron castings cool on 48-in. Link-Belt oscillating conveyors specially designed for gentle handling and cooling of hot castings —operating at 12 to 15 ft. per minute. Positive action, constant-stroke eccentric moves materials in uniform flow regardless of surges. Other 36-in. wide oscillating conveyors are also important in this foundry's operations.

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LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarborough (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

BAKER PERKINS SIZE 14

BATCH TYPE UNIDOR CORE AND MOLDING SAND MIXER FOR JOB FOUNDRIES

BAKER PERKINS Unidor Core and Molding Sand Mixers help speed up sand mixing operations and improve the quality of core and mold sand mixes so that you can produce good, clean castings that require less shakeout and machining time. These mixers rub, stir and knead in one operation without special aerating attachments. Gentle and thorough mixing action coats each grain of sand evenly with a thin layer of bond without breaking up the delicate silica grains. The mixed sand has a high degree of permeability, is homogeneous and does not require riddling.

BAKER PERKINS Unidor Sand Mixers are strong and well constructed with a simplified operating mechanism that helps keep maintenance and operating costs low. The No. 14 Mixer shown here has a fabricated steel trough shell and cast iron ends, renewable steel liners, and cast steel Sigma blades with renewable wearing shoes of hardened steel. It has a working capacity of 5.5 cu. ft. BAKER PERKINS Unidor Mixers are available for job foundries in capacities up to 35 cu. ft. These models can be adapted to or equipped with air or electrically operated skip hoists. A laboratory model with a working capacity of 1500 to 2000 grams is also available. For complete information, consult a BAKER PERKINS sales engineer or write us today.



BAKER PERKINS INC.

CHEMICAL MACHINERY DIVISION

SAGINAW, MICHIGAN

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For more facts, circle No. 157 on postage-free Reader Service card on p. 17 or 18

Products & Processes

continued from page 12

Platform Scale

Electrical weighing with automatic control of flowing powdered materials in hopper carts is the first application of a new floor-level platform scale just announced. Scales of 500 lb capacity can be set in a pit 10½ in. square and less than 12 in. deep. *Baldwin-Lima Hamilton Corp.*

For more facts, circle No. 119 on card

Iridium Isotron

New device for the remote handling of Iridium 192 in industrial radiography has been announced. Called an Iridium Isotron, it allows sources of up to 75 curies to be exposed at distances of up to 50 ft from the operators station. *Gamma Corporation.*

For more facts, circle No. 120 on card

Sectional Ring Linings

Three king-sized sectional ring linings that will accommodate most of the larger crucible furnaces have just been made available. Silicon carbide circle brick linings come in interior diameters of 34, 37 and 41 in. *Electro Refractories and Abrasives Corp.*

For more facts, circle No. 121 on card

Jointer Blade Sharpener

New tool designed to quickly sharpen the blades of any jointer, without removing the blades from the machine, has been announced. This eliminates resetting and readjusting the blades which is necessary when they are removed for resharpening. Unit is portable. *Foster Supplies Co.*

For more facts, circle No. 122 on card

Diamond Blade

New king-size diamond blade for cutting brick, tile, concrete, refractory and other types of hard masonry materials, is being offered. Blade is available in 14 in. and 16 in. sizes, and is made for wet cutting use on any standard type of masonry saw. *Cardinal Engineering Corp.*

For more facts, circle No. 123 on card

Abrasive Material

New abrasive product for barrel finishing has been announced. Material is made from selected grades of aluminum oxide and processed to remove all sharp edges which might scratch the work. Sizes range from two in. down. It is made in an electric arc furnace from bauxite. *Exolon Co.*

For more facts, circle No. 124 on card

Stainless Steel Master Alloys

Stainless Steel Master Alloys, refined, pre-alloyed metals specifically designed for remelting to produce precision castings, are based upon new techniques of closer metallurgical control than heretofore possible, so one analysis meets all specifications. *WalMet Engineering Co.*

For more facts, circle No. 125 on card

Dresser Cutter

New Dresser Cutter for sharpening abrasive discs has been announced. Called the Bealy Wise Type Dresser Cutter, it has slim "fingers" which pick abrasive grain from the surface of grinding discs instead of crushing the grain and rolling it off. *Bealy-Welles Corp.*

For more facts, circle No. 126 on card

Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20

More data, information, prices can be obtained on all advertised and listed products, bulletins, services by using postage-free

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Free Foundry Information

Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20

Sprue Mills

Bulletin No. 112 describes specially designed mills that clean sand from foundry sprue so that only cleaned sprue is charged into the cupola, effecting substantial savings in coke consumption—faster melting and less slag to handle. *Bartlett-Snow Co.*

For more facts, circle No. 127 on card

Heat Exchanger

Bulletin No. 124 covers how Niagara Aero Heat Exchanger applies to controlled temperature cooling of water, oil and other liquids and gases in a wide variety of industries with great cooling water savings. Saves piping, pumping and equipment costs. *Niagara Blower Co.*

For more facts, circle No. 129 on card

Alloy Steels

New 200-page handbook, "Alloy Steels Pay Off", is offered to engineers, purchasing and management personnel who are interested in the practical utility of alloy steels in modern equipment design. Highlighted are the economic advantages. *Climax Molybdenum Co.*

For more facts, circle No. 131 on card

Pressure-Sensitive Tape

Bulletin is available describing how paper-backed Scotch Brand Tapes are utilized for more selective sand and shot blasting jobs. No. 270 Flatback Tape has been especially constructed for use in splicing metal foils. *Minnesota Mining & Mfg. Co.*

For more facts, circle No. 128 on card

Industrial Trucks

New eight-page catalog illustrating and describing line of power industrial trucks has been issued. Included are sections on Elper fork trucks, high and low-lift platform trucks and crane trucks. Each truck is detailed in a separate section. *Elwell-Parker Electric Co.*

For more facts, circle No. 130 on card

Slide Rule Catalog

New 32-page slide rule catalog 164-A, on metal slide rules from simple basic units through standard scale arrangements to the advanced Dual-Base Log Log Vector Hyperbolic with Log Log Range from 10⁻¹⁰ to 10¹⁰; is now available. *Pickett & Eckel, Inc.*

For more facts, circle No. 132 on card

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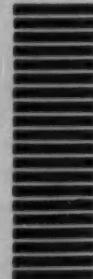
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Please have manufacturer send me without obligation information or bulletins indicated by numbers circled. For uncoded advertisements and Here's How items show page numbers on line below. For reprints or bibliographies show code number on line below.

PRODUCTS & PROCESSES	107	108	109	110
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CITY AND ZONE

Nickel Alloyed Cast Iron

Bulletin A-71 is a newly-revised edition, featuring applications of Ni-Resist, corrosion resistant nickel alloyed cast iron, in nine specific industries as well as in general industrial use. Tabulates mechanical and physical properties offered. *International Nickel Co.*

For more facts, circle No. 135 on card

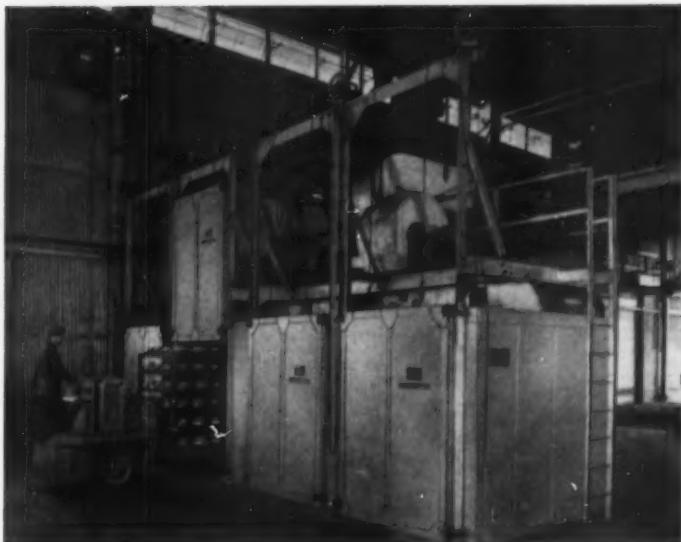
Impregnating Castings

Brochure pointing out how the use of the Wesco Process affords large savings by salvaging castings which would otherwise have to be rejected, is now available. Impregnation by the Wesco Process does not affect tolerances. *Western Sealant Co.*

For more facts, circle No. 136 on card
continued on page 20

Lower foundry costs begin with...

COLEMAN OVENS



Coleman Transtrack Ovens

The principal way of cutting costs in your coreroom is to get correctly baked cores and properly dried molds every time! Otherwise the efficiency of your core or mold making equipment, the skill of your labor and the best materials are wasted!

To reduce casting scrap, to save on labor, fuel and material, to produce consistently good castings, you need the best core baking and mold drying ovens available—Coleman!

Coleman Core and Mold Ovens are as fine as modern engineering and more than a half a century of specialized foundry experience can make them. Users are amazed at the improvement Coleman Ovens provide in uniform heating, accurate control, efficient work handling and dependable performance.

With production savings so important to profits, it will pay you to investigate the unusual advantages of Coleman Ovens now! As builders of the world's only complete line of foundry ovens, we have no reason to recommend any but the best oven suited to your purpose. For better castings at lower cost let our experienced Engineers give you practical recommendations for your particular requirements.

WRITE FOR BULLETIN 54

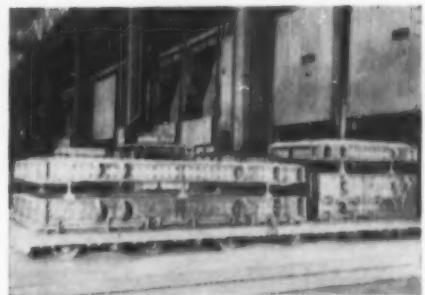
THE FOUNDRY EQUIPMENT COMPANY
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WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

For more facts, circle No. 163 on postage-free Reader Service card on p. 17 or 18



Coleman Tower[®] Oven



Coleman Car Type Mold Ovens



Coleman Dielectric Oven

A COMPLETE RANGE OF
TYPES AND SIZES ...

for every core baking and
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Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transtrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens



Free Foundry Information

continued from page 18

Tumbling Abrasive

Form ESA-236 is a four-page catalog bulletin covering Borolon Tumbling Abrasive. Describes aluminum oxide lumps and grain for barrel finishing a wide variety of parts and materials. Points out efficiency for deburring. *Simonds Abrasive Co.*

For more facts, circle No. 137 on p. 18

Gunning Practices

Booklet G-102, "Gunning Practices and the BRI Gun," discusses in some detail the history, development and current gunning procedures in open hearth and electric steelmaking furnaces; miscellaneous steel plant operations; and the foundry industry. *Basic Refractories, Inc.*

For more facts, circle No. 138 on p. 18

Silicone Grease

Brochure describes Dow Corning 41 Grease, a silicone fluid-carbon black mixture designed for high temperature, slow speed bearings. Applications discussed include oven conveyor bearings, dolly wheels, injection valves, and hold-down bolts. *Dow Corning Corp.*

For more facts, circle No. 139 on p. 18

Bonding Agent

Four-page folder describes Baroid's National Bentonite. Divided into four sections: better bonding better molds; many uses in foundries; physical characteristics, and produces finer castings, bulletin highlights many of the advantages of National Bentonite. *Baroid Div., National Lead Co.*

For more facts, circle No. 140 on p. 18

Cutting and Gouging Torch

New Case History Booklet, which shows many detailed on-the-job reports on the use of Arcair cutting gouging torch is available to any company or individual interested in the unique Arcair process of metal removal, using only an electric arc and compressed air. *Arcair Co.*

For more facts, circle No. 141 on p. 18

Standard Products Catalog

Standard Products Catalog No. 950, indexed book by Link-Belt, contains information on one of the most complete standard lines of power transmission and data on chains for conveying and ball and roller bearings. *Link-Belt Co.*

For more facts, circle No. 142 on p. 18

Fast-Drying Sprays

Technical Bulletin F-109 points out how speeded-up drying of green sand foundry molds is possible with new Stevens Fast-Drying Sprays. Production bottlenecks resulting from the often long wait required for drying of molds are eliminated. *Frederic B. Stevens, Inc.*

For more facts, circle No. 143 on p. 18

Reprints and Bibliographies

Reprints and bibliographies listed below have been made available by the AFS Technical Dept. or by AMERICAN FOUNDRYMAN. Ask for them by giving code designation on dotted line of postpaid Reader Service Card, pages 17-18.

RB1 . . "Casting Design"

RB2 . . "Gating and Riser"

RB3 . . "AFS Research" (lists 58 papers)

RB4 . . "Nondestructive Testing"

RB5 . . "Machinability"

RB6 . . "Casting Defects"

RB7 . . "Foundry Layouts"

RB8 . . "Shell Molding"

Carbon-Dioxide Process

Publication intended to give the foundrymen an introduction to the Carbon-Dioxide process gives details based upon experience and foundry trials in which Fesco CO₂ Set has been employed. Since process is comparatively new, information is limited. *Foundry Services, Inc.*

For more facts, circle No. 144 on p. 18

Leak-Proof Aluminum Castings

Booklet, "How to Produce Leak-Proof Aluminum Castings," cites various recommendations for minimizing porosity in aluminum castings. Suggests operational methods by which castings of intricate design and high quality can be produced. *George Sall Metals Co.*

For more facts, circle No. 145 on p. 18

Hardness Tester

Bulletin No. A-16 describes and illustrates the Wolpert-Gries "Mirco-Reflex" hardness tester with optical system by Carl Zeiss, designed for loads from 10 to 3000 gm. Contains complete details concerning load application, optical equipment, and test procedure. *Gries Industries.*

For more facts, circle No. 146 on p. 18

Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20

Sand Tempering Equipment

Bulletin points out how Sand Tempering Unit adds the correct amount of water to the sand to give the desired moisture percentage at the molding station. Moisture in the returned sand is accurately measured to determine the required base water. *Harry W. Dietert Co.*

For more facts, circle No. 147 on p. 18

High Production Cleaning

Bulletin No. 744-2 on airless abrasive blast cleaning describes how to attain high cleaning rates in foundries producing large and heavy castings which will withstand a tumbling action. Gives illustrated case histories. *American Wheelabrator & Equipment Corp.*

For more facts, circle No. 148 on p. 18

Spur-Gear Hoists

Bulletin YC and YCT includes pictures, cutaway drawings, descriptions and specifications of the entire YC and YCT lines of spur-gear hoists, making a total of 62 different sizes and models with capacities from $\frac{1}{4}$ to 25 tons. Specialized applications are also shown. *Coffing Hoist Co.*

For more facts, circle No. 149 on p. 18

Conveyor Belts

New Four-page catalog gives complete line of solid woven, rubber and stitched canvas produced by Main Belting. Detailed specifications are given on all of the solid woven and rubber belts which have been added to the Main Line. Copies are available on request. *Main Belting Co.*

For more facts, circle No. 150 on p. 18

Collection Electrodes Cleaning

New six-page bulletin describes the MI Rapper, a device for automatic and continuous cleaning of the collection electrodes in a Cottrell electrostatic precipitator. Includes a schematic diagram of the rapper and an explanation of its basic operating. *Research-Cottrell, Inc.*

For more facts, circle No. 151 on p. 18

Material Handling

"How-they-do-it" case histories of effective installations of straddle carriers and fork trucks in the scrap, foundry and refractory industries are featured in the current 24-page issue of "Material Handling News." All case histories are illustrated. *Clark Equipment Co.*

For more facts, circle No. 152 on p. 18



Tough—that's Malleabrasive Shot and Grit! Tough because it's scientifically heat-treated and laboratory controlled for consistency and strength... to clean better and faster, last longer. And because it does a better job quicker with less replacements, Malleabrasive cleans *cheaper*!

Prove this to yourself. Next time you need blast cleaning abrasive, order a tough one! Order Malleabrasive from PANGBORN CORPORATION, 1300 Pangborn Blvd., Hagerstown, Maryland.

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U.S. Patent #2184926 (other patents pending)

Letters to the Editor

Toward More Accurate Clay Determinations

The method proposed by J. S. Schumacher ("Clay Test for Carbon-Bearing Sands," *AMERICAN FOUNDRYMAN*, March, page 41) is a real improvement in the laboratory procedure for obtaining a more accurate value of the AFS clay content of a molding sand. In sands containing substantial percentages of organic materials, the simple washing procedure does not provide a clay content value that the foundryman can interpret in terms of the actual clay percentage in the sand. All one can say is that the actual clay content is some value less than the one obtained by the conventional washing procedure. The proposed procedure does give a more accurate value of AFS clay substance in the sand as defined by the *FOUNDRY SAND HANDBOOK*. However, it should still be recognized that even the improved clay substance value may include silt, fine silica, burned clay, seacoal ash, or any fine particle failing to settle one inch per minute. The true active clay content is still somewhat lower than the value obtained by the new procedure.

RICHARD W. HEINE, Assoc. Prof.
Mining & Metallurgy Dept.
University of Wisconsin

The Deere & Co. procedure for determining clay is similar to the one described by Mr. Schumacher in the March issue of *AMERICAN FOUNDRYMAN*. A 50-gram sample of sand is dried and the moisture content determined. The dried sample is then washed by the standard AFS procedure. After washing, the sample is filtered, placed in a crucible, and ignited at 1600-1800 F to constant weight. The loss in weight is clay plus carbon. A second dried sample of the sand is checked for total carbon by igniting a 2-gram sample at 1600-1800 F to constant weight. A sample calculation shows:

Weight of dry sand after moisture test	48.00 gr
Weight of sample after washing and burning	43.00
Total loss	5.00
Per cent total loss (clay and combustibles)	10.4%
Per cent combustibles obtained on 2-gram sample	6.2%
Per cent clay in sand	4.2%

We realize that the combined water of the clay is lost on ignition and that this results in a lower clay percentage and a higher loss-on-ignition. However, we feel that this difference is slight and that our results from week to week are comparable.

JOHN G. SMILLIE, Materials Eng.
Dept. John Deere & Co.
Moline, Ill.

The Schumacher and Smillie procedures are similar to the Myers procedure (*AMERICAN FOUNDRYMAN*, March 1952, page 59), differing only in detail. The time seems ripe for development of a standard procedure, which might include recommended correction factors for various types of clays to account for the small loss in combined water.—EDITOR.

Report from Lebanon

I am associate professor of industrial engineering and besides teaching machine design, management methods, time and motion study, metallurgy, I also do some work on the productivity of local industry.

Consulting work is complicated by the language problem. Usually the conference starts out in English. Then when the going gets tough it switches to French, Armenian, and Arabic. I sit around while my suggestions are hashed over in several languages.

My contract ends in June and I would like to go back into management work in the foundry.

HERBERT H. FAIRFIELD, Assoc.
Prof. School of Engineering
American University of Beirut
Beirut, Lebanon

Tear Sheets Gladly Sent

Will you kindly send tear sheets of the article entitled "Cupola Gas Scrubbers" by O. J. Brechtelsbauer, which appeared in the February 1955 issue of *AMERICAN FOUNDRYMAN* on pages 34-37. Thank you very much.

C. R. ROSS, Ind. Hygiene Engr.
Dept. of National Health &
Welfare, Ottawa, Ont., Canada

Kindly send us two copies of "Advantages of Automatic Moisture Control" by William E. Patterson, as contained in *AMERICAN FOUNDRYMAN* of February 1955 on pages 48-49.

A. J. DEMPSEY, Vice-Pres.
Crucible Steel Casting Co.
Milwaukee

I would appreciate your sending tear sheets of "Pig Iron Specifications," pages 69-70, February 1955 issue of *AMERICAN FOUNDRYMAN*, and the continuation which appears in the March issue.

J. D. CLENDENIN
Schuylkill Haven, Pa.

Please send us two reprints of the article "Reproducibility of Core Sand Tests" by O. Jay Myers, which appeared in the February issue of *AMERICAN FOUNDRYMAN*, pages 54-63.

F. V. HERR, Mgr. Ind. Eng.
Pratt & Letchworth
Buffalo, New York

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Chicago 3

Illinois—Marthens Company
Moline

Massachusetts—Klein-Farris Co., Inc.
Boston 11

Michigan—Foundries Materials Company
Coldwater (Main Office), and
Dearborn

Minnesota—Smith-Sharpe Co.
Minneapolis

Missouri—Mr. Walter A. Zeis
Webster Groves

New Jersey—Asbury Graphite Mills, Inc.
Asbury

New York—Combined Supply & Equipment Co.
Buffalo 7

New York—G. W. Bryant Core Sands, Inc.
McConnellsburg

Ohio—Stoller Chemical Co.
Akron 20

Oregon—La Grand Industrial Supply Co.
Portland 1

Pennsylvania—Pennsylvania Foundry Supply & Sand Co.
Philadelphia 24

Tennessee—Robbins & Bohr
Chattanooga

Washington—Carl F. Miller & Co., Inc.
Seattle 4

Washington—Pearson & Smith Distributing Div., Spokane Pre-To-Log Co.
Spokane

Wisconsin—Interstate Supply & Equipment Co.
Milwaukee 4

Canada—Canadian Foundry Supplies & Equipment, Ltd.
Montreal, Quebec (Main Office)
and Toronto, Ont.



REJECTS Make
Your Profits Disappear

NATIONAL BENTONITE

Bonds Better to Prevent Rejects

All bentonites are not the same — and the difference between brands may spell the difference between profit and loss on your castings. That's why scores of foundrymen the nation over choose National Bentonite. The exceptionally high quality of this bentonite bonds better molds, helps measureably to prevent costly rejects.

National Bentonite provides exceptionally good green strength, higher hot strength, greater mold permeability, higher tensile strength and other characteristics — all which help eliminate the danger of casting blows, scabs, gas holes, and other defects that waste your money.

National Bentonite is mined from the purest, finest deposits of bentonite in the world. It is processed by the world's largest, most experienced producer of bentonite. National Bentonite is the finest money can buy. Use it and lower your reject loss.

Available from better foundry suppliers everywhere. Write today for specifications and prices.

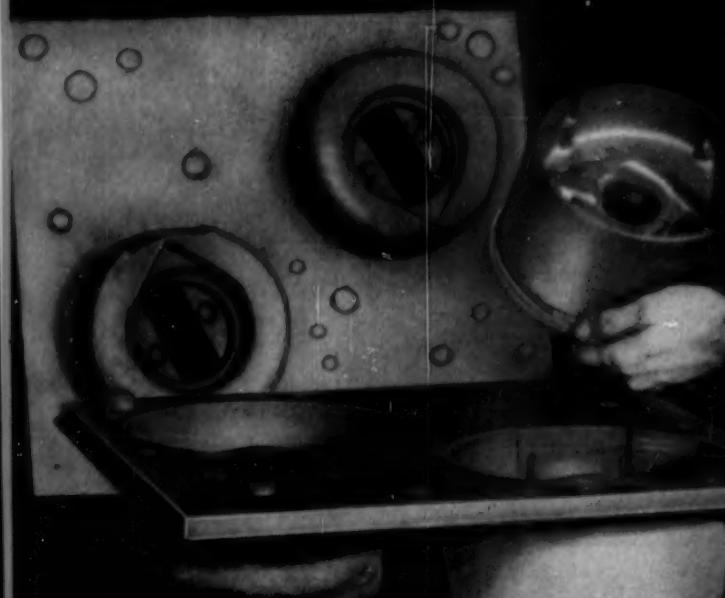


Baroid

Baroid Division ★ National Lead Company

Bentonite Sales Office: Railway Exchange Building, Chicago 4, Illinois

Profit
Pictures



Foundryman inspects smooth finish of 8-lb. housing for Hotpoint Disposall* as part is taken from shell mold bonded with Resinox 736.

Leading gray iron foundry gets stronger molds using **Resinox 736!**

Shell molding pioneer selects Monsanto phenolic resin for its outstanding performance

"Much of the credit for our successful shell molding of garbage disposal housings must go to Resinox 736," according to Wayne Wright, shell molding engineer for Woodruff & Edwards, Elgin, Illinois.

"We have used other resins extensively in our plant and are now convinced that Resinox 736 provides a stronger mold. There is perfect uniformity in each batch we order."

The housings, made for the famous Hotpoint Disposall, were originally die cast and consisted of two

separate parts. Now that the housing is shell molded, it consists of a single unit that is lighter in weight and less expensive to produce.

There is a further saving because far less cleaning and machine finishing are now necessary.

The Woodruff & Edwards project is only one of a long line of outstanding shell molding jobs in which Monsanto resins are being used.

For shell molding, core binding or sand conditioning resins that are research-developed and shop-tested to meet *your* foundry needs, write first to Monsanto Chemical Company, Plastics Division, Springfield 2, Mass.

For stronger shell molds, specify

RESINOX

MONSANTO

*Disposall is a registered trade-mark of Hotpoint Co.



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generation of foundrymen



Foundry scene
in
Purdue
University's
shop
laboratories

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In the foundry course, students in the Michael Golden Shops actually experience metal melting, molding and casting. Here shown is non-ferrous melting in modern Crucible Furnaces.

In your foundry, too, Crucible melting will prove most satisfactory--for Economy, Flexibility, Adaptability, Speed, Ultimate Satisfaction.

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REQUIREMENTS FOR CRUCIBLE MELTING

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CRUCIBLE *Manufacturers Association*

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New York 5, N. Y.

Foundrymen in the News

Stephen D. Moxley, former executive vice-president, American Cast Iron Pipe Co., Birmingham, Ala., has been named president to succeed Charles Otto Hodges who retired after 38 years of service. **Frank H. Coupland** became vice-president and works manager, **Arnold J. Herrmann** was named vice-president and sales manager, **Kenneth R. Daniel** was named vice-president and chief engineer, and **A. E. Bowen** became treasurer.

William H. Shinn has been appointed sales manager of the Foundry Div., Gunite Foundries Corp., Rockford, Ill. Mr. Shinn had been serving as assistant sales manager.

E. E. Pollard, formerly vice-president and general manager of Caldwell Foundry and Machine Co., Birmingham, Ala., and chairman of the Birmingham Chapter of AFS, has accepted the position of chief engineer of Tyler Pipe and Foundry Co., Tyler, Texas.

Edward D. Boyle, formerly master molder with Puget Sound Naval Shipyard, Bremerton, Wash., has organized the Boyle Foundry Service Co. in Seattle. Mr. Boyle has been with Puget Sound Naval Shipyard since 1916, where he has since been a molder, supervisor, and master molder. Mr. Boyle is a past president of the Washington Chapter of AFS and has written several papers for *AMERICAN FOUNDRYMAN*.

H. Wesley Stokes has become treasurer of Kilbourn Pattern Co., Inc., Milwaukee. Stokes was formerly Pattern Supt. of Waukesha Foundry Co., Waukesha, Wis.

Gilbert E. Kempka, formerly an instructor in the Department of Mining and Metallurgy, University of Wisconsin, is chief metallurgist at Johnson Motors, Waukegan, Ill.

Harry C. Ahi has joined the National Bearing Div. of American Brake Shoe Co. as product engineer. He was formerly associated with Down River Casting Co., Rockwood, Mich.

William J. Ryan has been appointed assistant to the executive vice-president and general manager of Cleveland Crane & Engineering Co., Wickliffe, Ohio. Mr. Ryan formerly held the positions of personnel manager and office manager.

Dr. James A. Krumhansl, formerly associate professor of physics at Cornell University, has joined the staff of the Research Laboratories of National Carbon Co., a Division of Union Carbide and Carbon Corp., as assistant director of research.

Frank Turnbull has joined Sipi Metals Corp., Chicago. He will operate from the Detroit office.

William Hoese, formerly with West Michigan Steel Castings Co., has joined Lakeside Malleable Castings Co., Racine, Wis., as assistant superintendent.

Admiral Alan G. Kirk has been elected chairman of the board of Alloy Precision Castings Co., Cleveland. Other board members elected were **Ronald D. Gumbert**, **Waldo Hatch**, **E. D. Hepper**, and **Peter D. Kleist**. Officers of the company were also elected, and include: **Admiral Kirk**, president; **Ronald D. Gumbert**, chief executive officer; **James J. Laughlin**, secretary-treasurer; and **Theodore Hart**, assistant treasurer.

William W. Lamb has been appointed sales manager of Precision Metalsmiths, Inc., Cleveland.

Harry M. Pier, formerly general sales manager of Research-Cottrell, Inc., has been appointed special assistant to the chairman of the board to conduct new studies in the field of atmospheric pollution. **Charles E. Beaver**, formerly assistant sales manager, succeeds Mr. Pier as general sales manager of Research-Cottrell, Inc.

James R. Crein has been appointed a representative for the Stevens foundry line in Southern Illinois and the St. Louis area.

Kenneth MacKey Smith has opened a foundry consulting service with temporary office in the Schroeder Hotel, Milwaukee. Formerly with Carl E. Rowe, Milwaukee, Hansell-Elcock Co., Chicago, and other foundry firms, he has also been a consultant to Italian foundries under the Mutual Security Agency productivity program.

James L. Buchene has been appointed sales engineer for iron and bronze foundry products in Western Pennsylvania, Northern W. Va., and Southern Ohio for Baldwin-Lima-Hamilton Corp., Philadelphia.

H. R. H. The Duke of Edinburgh has been elected an honorary member of the Institute of British Foundrymen.

Nelson M. McGuire has been appointed assistant to the vice-president for sales of American Manganese Steel Div. of American Brake Shoe Co. Formerly assistant advertising manager in charge of advertising for three divisions of the company, Amsco, National Bearing, and Electro-Alloys, Mr. McGuire will continue to handle the advertising for Amsco in addition to new sales responsibilities.

Dr. James T. Eaton has been elected vice-president in charge of production of E. F. Houghton & Co., Philadelphia.

Jerome B. Wellester has joined the staff of Inductotherm Corp., Glenolden, Pa., as a director of sales and service.

Charles H. Lundquist, formerly associated with the Consolidated Western Steel Div., United States Steel Corp., has been elected president of Western Sealant Co. with headquarters at Culver City, Cal.

James H. Farnell has been appointed technical sales engineer of Louthan Manufacturing Co., a subsidiary of Ferro Corporation, East Liverpool, Ohio.

Eugene Easterly has been appointed vice-president in charge of distribution, and **E. G. Hickling**, vice-president in charge of operations, of Linde Air Products Co., a Division of Union Carbide and Carbon Corp., New York.

Lewis W. Bentley has been appointed manager of the Detroit office of Industrial Crane & Hoist Corp.

continued on page 28



S. D. Moxley . . . president



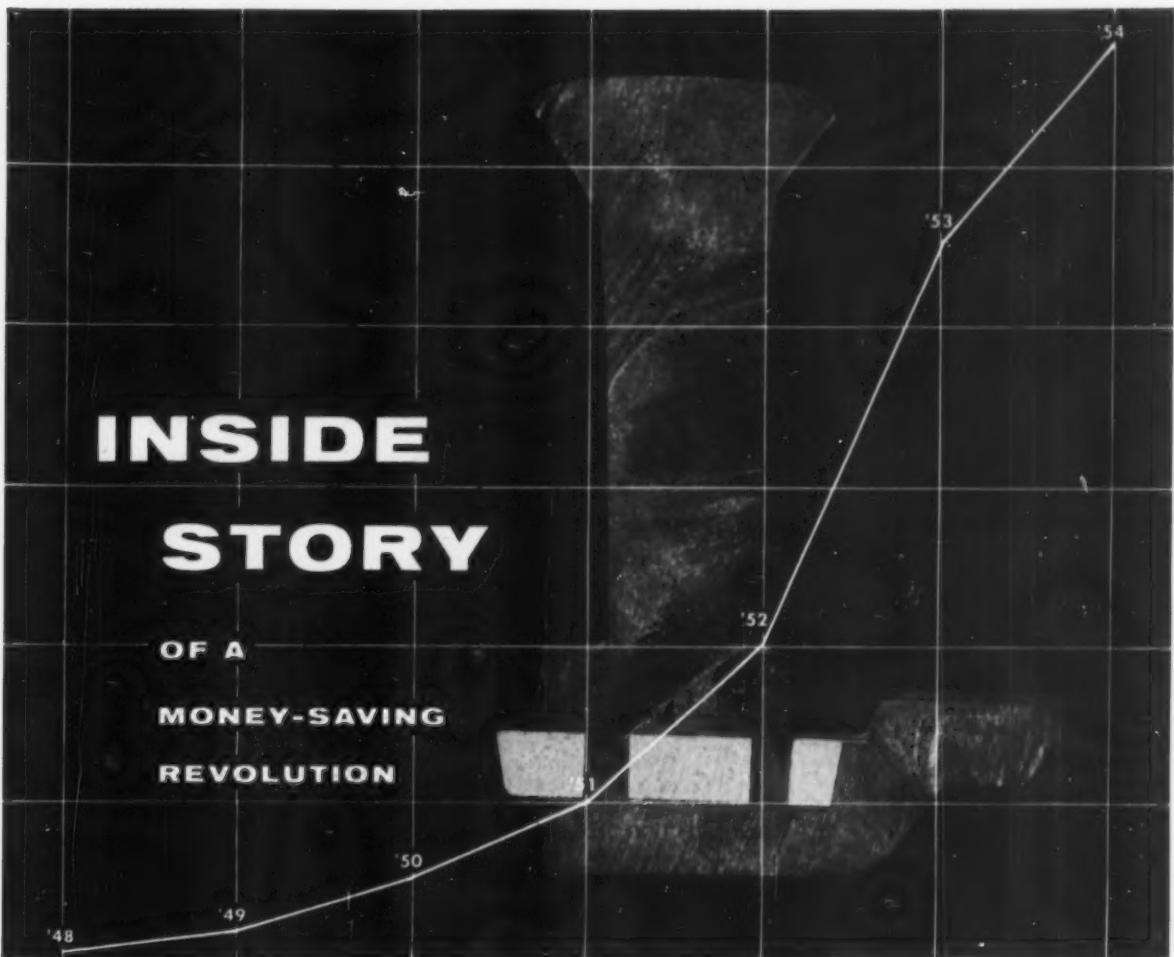
W. H. Shinn . . . Sales mgr.



E. E. Pollard . . . with Tyler



E. D. Boyle . . . forms firm



INSIDE STORY

OF A
MONEY-SAVING
REVOLUTION

Take a *second look* at that cutaway casting above! Note the clean, sharp lines where the molten metal has passed through the strainer core. Here is *proof* that Louthan Refractory Cores give you closer control of the metal. They also keep slag and core-sand inclusions out of castings, save needless grinding and rejects.

Now, take a look at the sales curve above! That tells a significant story of the growing use of *refractory* strainer cores. There is only

one reason for this: *they save money* for foundrymen in the making of castings.

Louthan Refractory Cores will withstand 3,000°F. temperatures without spalling or disintegrating. They are exceptionally uniform, dimensionally accurate, easy to use.

If you haven't yet tried them, we invite you to do so. Standard sizes range from 1½" to 3½" diameter, while special sizes and shapes can be made for your specific requirements. Why not write for full details?

Louthan

REFRACTORY
STRAINER CORES

Louthan Mfg. Co., East Liverpool, Ohio (Subsidiary of

 **FERRO** Corporation)



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R. J. Geltman . . . chief engr.



R. C. Hobson . . . promoted



A. S. Bixby . . . manager



N. Kowall . . . superintendent

continued from page 26

Russell J. Geltman has been appointed chief engineer for Link-Belt Company's plant in San Francisco. He will direct the design of all equipment made at this plant.

Roy C. Hobson has been promoted to manager of the Chicago plant of National Malleable and Steel Castings Co., and **Allen S. Bixby** has been made manager of the Melrose Park plant.

Nicholas Kowall has been promoted to superintendent of the Steel Div. Superior Steel and Malleable Castings Co., Benton Harbor, Mich. Kowall was formerly superintendent of the Cleaning Div. of the steel foundry and has been with Superior Steel since January 1946.

Roy L. Salter has been appointed first vice-president of the Southern Wheel Div. of American Brake Shoe Co. Formerly vice-president of the Southern Wheel Div., Mr. Salter has been with the company since 1924.

Leslie L. Andrus, vice-president of American Wheelabrator & Equipment Corp., Mishawaka, Ind., has been elected to the board of directors of the corporation. **Harold M. Miller**, vice-president of the corporation since 1944, and a member of the firm since 1923, was also elected director. The third director elected was **Roy P. Whitman**, first vice-president of Bell Aircraft Corp., Buffalo, N. Y. **Verne E. Minich**, founder of American Wheelabrator, remains chairman of its 15-man board.

Frank S. Brewster, formerly vice-president and general manager of Harry W. Dietert Co., Detroit, has been appointed chief metallurgist of South Gate Aluminum & Magnesium Co., South Gate, Cal. Mr. Brewster is the chairman of the Sand Div. of American Foundrymen's Society.

Harvey Hewitt, recently retired vice-president in charge of sales for Bethlehem Pacific, has been elected a director of General Metals Corp.

Arthur J. Zahn has been promoted to employee relation manager of Eaton Manufacturing Company's Foundry Div., Vassar, Mich. Zahn joined Eaton in 1950 in the capacity of safety director and prior to his recent promotion was budget supervisor.

Vernon C. Robinson has joined the Development and Research Div. of International Nickel Co., Inc., as a member of the Twin Cities Technical Field Section at Minneapolis.

George E. Schultz has been named general foreman, pattern shop and brass foundry, at Allis-Chalmers Norwood Works. Prior to being named to his new post, Schultz had been a metallurgist since 1952 in the works' development laboratory.

Harold Wheeler has been named personnel director of Allyne-Ryan Foundry Co., Cleveland. Mr. Wheeler was previously associated with Superior Foundry, Inc., Cleveland.

Ralph A. Colorado, of San Juan, Puerto Rico, has recently been appointed export manager for Rockford Brass Works, Inc.

and Whitney Metal Tool Company, both of Rockford, Illinois.

Sherwood Bassett Seeley, technical director, Joseph Dixon Crucible Co., Jersey City, N. J., received citation during the Midwinter Convocation of New York University College of Engineering at its Centennial Celebration for being a credit to this institution in which he received part of his education.

A. F. Anziover has been appointed vice-president of the Mercast Manufacturing Corp., LaVerne, Cal., a subsidiary of the Mercast Corp., New York. **William A. Damerel** has been appointed vice-president and Dr. **Fred Schulman** was appointed assistant director of research of the Mercast Corp.

Leslie B. Bellamy, formerly general manager of Sterling Abrasives, has been appointed general manager of operations of Sterling Grinding Wheel Co. **Kenneth E. Leutzenhiser** has been appointed assistant treasurer of Sterling as well as office manager. **Gilman E. Farley** was appointed works manager of the Sterling plant, and **L. V. Dippell** has been appointed manager of research and development for Sterling. Manager of research and development organic for Peninsular will be **John R. Gregor**. **Harold E. Erf** will serve Sterling as manager of sales administration while **O. J. Leutermilch** was appointed manager of sales engineering for the same organization. **Frank O. Klapp** will be advertising and public relations manager for Peninsular and Sterling.



R. L. Salter . . . first v-p



L. L. Andrus . . . director



H. M. Miller . . . elected



R. P. Whitman . . . appointed

BENTONITE as you like it!

Black Hills 80 . Granular, produced to the lowest possible dust level to eliminate loss at the muller. For maximum efficiency with systems which include fines-removal equipment.

BLACK HILLS BENTONITE
pulverized or 200-mesh. Selected by foundries generally for rapid mulling. Strong, uniform, dependable.

Black Hills Slurry Grade.
Coarser than our 80-fineness grade; recommended for rapid dispersion and maximum efficiency in water when clay is added to sand as a slurry.



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INTERNATIONAL MINERALS & CHEMICAL CORPORATION

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For more facts, circle No. 161 on postage-free Reader Service card on p. 17 or 18.

April 1955 • 29



IN THE
SIMPSON MIX-MULLER

**SAND CONTROL
STARTS HERE**



**RATHER
THAN HERE**



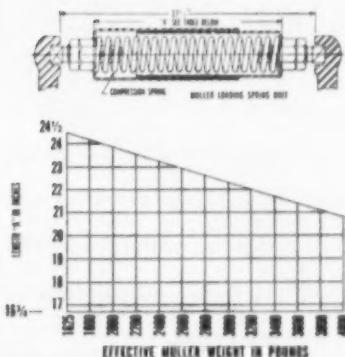
WRITE FOR
BULLETIN 511
ON THE NEW
ZF AND JF
MIX-MULLER

LOADED MULLERS MAKE THE DIFFERENCE!

• That's the business end of a hard-working 3F Simpson Mix-Muller on the opposite page. In a phone call on the first day it was used, the owner advised us of an unusual increase in green strength in his sand.

It turned out that he hadn't reduced the amount of bond he was accustomed to using—all of his new bought efficiency was going to strength. A simple adjustment of the spring tension on his mullers . . . and a 50% reduction in his bond consumption brought him more efficient control over his sand than he has thought possible after 30 years in the business.

That's why we say that the new F Series Mix-Muller is *more* than a mixer—properly used, it is a vital instrument of control over all sand properties and the flexibility afforded through spring loading provides the necessary versatility to meet *every* foundry's sand requirements.

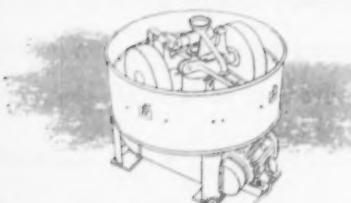


HERE'S HOW IT WORKS

Now available on models having from 50 to 4000 lbs. batch capacity, spring-loaded mullers are designed to transmit variable muller pressure to the sand bed through mullers of comparatively light initial weight. In this manner, maximum muller pressures are developed as the sand increases in strength during mulling . . . when this pressure is most needed.

The chart at left shows how each muller, on the new 4000 lb. batch 3F Mix-Muller, can provide effective mulling pressures ranging from 1600 lbs. initial weight to 4000 lbs. pressure. That's a saving of 2400 lbs. in dead weight and your assurance of positive control over mixes from the slickest core sands to the toughest steel sands . . . at the turn of a wrench!

HOW THE NEW SIMPSON MIX-MULLER CAN GIVE YOU MORE FOR EVERY MULLING DOLLAR



LOW MAINTENANCE

* Centralized lubrication, anti-friction bearings throughout and new, easy access door through crib are only a few of the many features that add up to long life, low cost, and easy maintenance for the new F Series Mix-Muller.

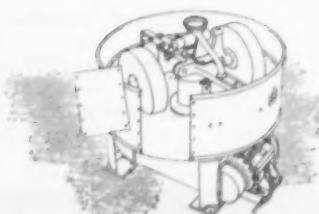
SIMPLE, RUGGED, DEPENDABLE

* Years of practical mixer engineering, intensive research, testing and modernizing of long proven mixer designs combine to give you today's kind of sand control, operating and maintenance helps . . . in a mulling principle that has been an industry standard for over 40 years.



STATIONARY PAN — BOTTOM DISCHARGE

* In a Simpson, stationary pan principle and automatic bottom discharge mean that all power is used to mix . . . This adds up to longer life for your muller . . . lower operating costs.



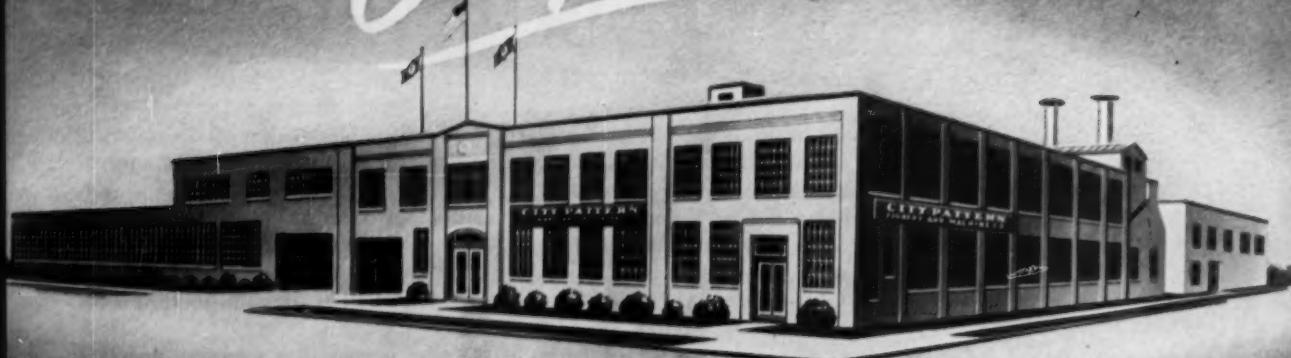
National Engineering Company
(Not Inc.)

630 Machinery Hall Bldg. • Chicago 6, Illinois

PRODUCTS OF A PRACTICAL FOUNDRYMAN



Here are *Complete facilities...*



for your **CAST AND
MACHINED PARTS**

City Pattern Foundry & Machine Company offers unparalleled facilities for the complete production of cast and machined parts. Working directly from your part print, we make the pattern, cast the parts and then precision machine them; all operations are performed right under our own roof.

In every phase of the processing the most modern methods and equipment are used. And to safeguard consistent high quality, every known piece of inspection equipment is on hand to chemically, physically and dimensionally measure your parts before shipment.

Thus, complete responsibility for your cast machined parts are in the hands of one competent, completely equipped source. Why not take advantage of the obvious benefits next time you are ordering cast and machined parts.



SETTING THE PATTERN IN PATTERNS

Since 1913...

CITY PATTERN
FOUNDRY AND MACHINE CO.

PHONE TR-4-2000

1161 HARPER AVENUE, DETROIT 11, MICHIGAN



Talk of the Industry

THERMENOL, new lightweight, high-strength, heat and oxidation resistant alloy developed by the Navy's White Oak Ordnance Laboratory, can be cast (as well as rolled) and at least one foundry is making castings. An iron-base alloy containing 15-16 per cent aluminum and about 3 per cent molybdenum, the new material is ferritic, has excellent magnetic qualities, and high electrical resistivity. Density is about 20 per cent less than stainless steel. Temperature resistance is good as high as 2300 F. Stress-rupture values are superior to most ferritic stainless steels, not far below those for austenitic stainless.

EMPLOYMENT OPPORTUNITIES among foundries for both graduating engineers and summer student engineers are being surveyed again this year by the Foundry Educational Foundation. If you contemplate hiring graduate or summer workers, fill in the form sent by FEF so some 60 colleges will know of your intent. If you mislaid the form, request another from Foundry Educational Foundation, Terminal Tower Bldg., Cleveland 13, Ohio.

CASTINGS of stainless steel, brass, bronze, or similar alloys have a new competitor in rigid PVC (non-plasticized polyvinylchloride), a plastic that until recently resisted efforts to produce low-cost parts. Valves and pipe fittings molded from the material already are finding a wide market, the processor claims. Rigid PVC is rust-proof rather than rust resistant, it is reported, with the plastic being less than half the cost and weight of stainless steel of comparable strength and exceeding it in resistance to a long list of organic and inorganic chemicals and reagents.

IRON POWDER ELECTRODES, fastest depositing of any manual type electrode, covered in a new specification just released by A.S.T.M. and A.W.S., Specification (A233-55T) for Mild Steel Arc-Welding Electrodes, should interest steel foundries aiming to cut welding costs. Made with a cover containing a high percentage of iron powder in combination with fluxing ingredients, the electrodes have a high deposit rate because the iron powder fuses and deposits as weld metal along with the core wire.

MEMO POSTED by the Pappas Refrigeration Co., Houston, Texas, is a commentary on the good old-fashioned habit of work which sometimes seems to be growing increasingly outmoded: "Due to increased competition and a desire to stay in business, we find it necessary to institute a new policy. We are asking that somewhere between starting and quitting time, and without infringing too much on the time usually devoted to lunch periods, coffee breaks, politics, rest periods, story telling, ticket selling, vacation planning, and the rehash of yesterday's TV programs, each employee endeavor to find some time that can be set aside and known as the work break."

Herbert D. Scobie



J. E. STOCK / *Division Supt.*
John Deere Waterloo Tractor Works
Waterloo, Iowa



A. V. SCHOVILLE / *Division Supt.*

Casting Precision Patterns in Zircon Molds

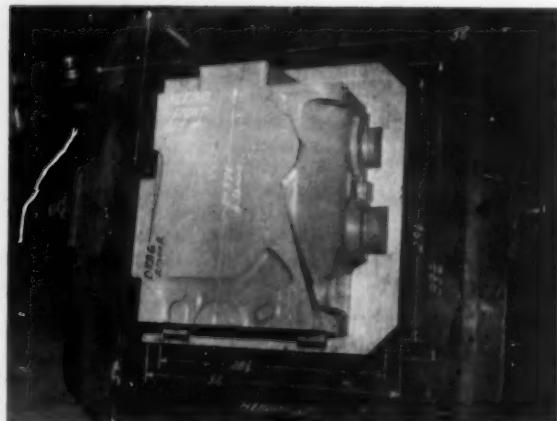
Cast iron patterns without finish allowance take only one-fifth or less the finishing time of those cast in the usual way. Written discussion of this paper, Convention Preprint No. 55-74, should be sent to American Foundrymen's Society, Gulf & Wolf Roads, Des Plaines, Ill. The paper is one of four to be presented at the Pattern sessions of the AFS Convention in Houston, May 23-27, 1955.

■ Producing gray iron patterns to precision tolerances in zircon sand molds has become standard practice in the foundry at the John Deere Waterloo Tractor Works. For the past two and one half years, all patterns for use on molding units where molds are rammed by slingers or jolt-rollover machines, have been made by the process explained in this paper.

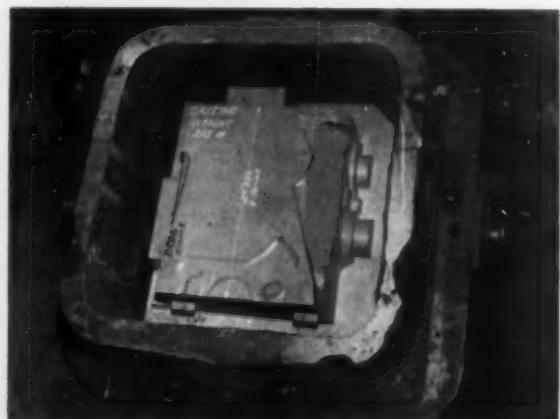
The use of regular foundry facilities, equipment, and supplies that are a part of every foundry, places this method within the reach of any who may desire to reduce the amount of time that is required to produce a finished pattern from the completed wood master pattern. As this paper is concerned only with one type of pattern castings, any further reference to patterns not designated as master patterns, will indicate as-cast gray iron patterns.

Equipment. The necessary equipment required using this method consists of a pin-lift molding machine, heavy-duty hoist, several sets of flasks of sizes ranging from 18 x 18-in. square to 60 x 60-in. square with 12 to 14 in. depth in both cope and drag. Other sizes may be used according to size desired and capacity of oven the mold is to be baked in.

Cast iron plates for master patterns to be mounted on, and also, cast iron plates for use as driers, are cast and machined on both sides. The mounting plate is made from four to six inches larger than the outside diameters of the flask and is 1½ inches thick. The drier plate is made to the same dimensions as the outside



Mahogany master pattern mounted on cast iron plate.



Flask is bolted with machined flange to pattern plate.

dimension of the flask, and $\frac{3}{4}$ -in. diameter holes are drilled through the plate on 3-in. centers to allow for escape of steam and for use of stick venting the mold to release the gas when mold is poured. The cope and drag flasks are machined on all flange faces to assure a proper joint when bolted to the plates and also at the parting between cope and drag when mold is closed.

Master Patterns are made from wood or plaster or both. Plaster patterns can be made from either the regular types of plaster or the expansion type plaster. Where plasters are to be used as master patterns in this method, no coating of any kind is used. The plaster master pattern is ready to use by removing any grease with a solvent such as alcohol or carbon tetrachloride. Where wood and plaster are used in the construction of the master pattern, the wood part of the master pattern is treated the same as an all-wood master pattern.

Do Not Use Shellac for Base

In all cases, whether wood or plaster is used to make the master pattern, do not use a shellac for a base in applying a coating. A commercial lacquer is available that has produced excellent results in obtaining a smooth surface on the face of the mold cavity without trapping or vibrating the pattern when drawn. Wood

master patterns are made from pattern mahogany with no allowance for any excess machine finish with the exception of the mounting face, or on ends where a metal pattern is to be cast in more than one piece and joined together on the plate.

Good Mahogany Patterns Advantageous

The time involved in making a master pattern without allowance for machine finish is in some cases twice that of the conventional method. Lightener core boxes are constructed of pine; follow boards and/or frames are made of pine and hard wood. All fillets on wood master patterns are of wood or plastic wood. Wax and leather fillets are eliminated as fillet material. Wax because of its adhesive qualities and leather because of the tendency of curling. Making good mahogany master patterns can be especially advantageous in many ways. Minor engineering changes, or alterations, can be made at any time that a change of design would necessitate casting a new pattern, duplicate precision patterns or replacement patterns can be made from a well-constructed mahogany master pattern.

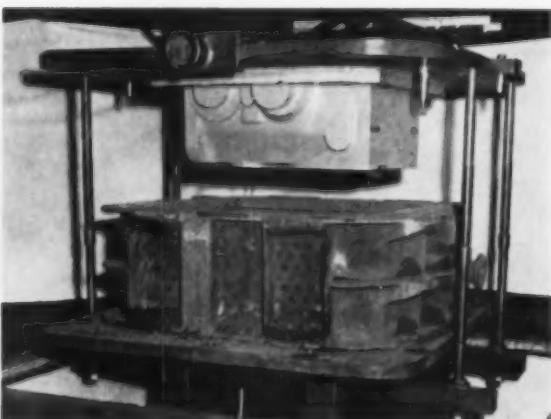
The first and most important step in the attempt to make a precision cast pattern was to determine the proper shrink scale to be used to construct the master pattern. As the standard shrink scales produced a pat-



Zircon sand facing is backed with regular core sand.



Pin lift machine in pit to give more overhead space.



Hydraulic pressure gives smooth pattern draw.



Green mold is inspected before baking.



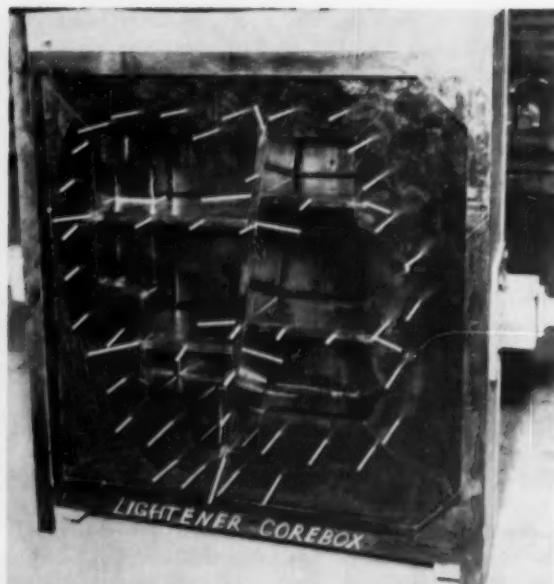
Sharp corners are assured by going over with file tang.

tern casting either undersize or oversize by 0.015 or 0.020 inches, a special scale of 17/64-in. shrink per foot is now used for making any master patterns of 18-in. length or width, and a 1/4-in. shrink scale is used on larger patterns. The shrinkage of the rough casting will have a direct effect in determination of the proper shrink for making the master.

Lightener Core Boxes Are Important

Lightener core boxes are also important in the method in order that a uniform wall thickness be maintained in the cast pattern and to assure metal distribution through the core into the walls and rib sections.

Molding Procedure. The method of making the mold is very important to production of a very smooth cast surface on the pattern casting. Zircon sand provides such a surface. The master pattern is mounted on the steel mounting plate and bolted to the flask. The face of the pattern is covered to a depth of at least one inch



Lightener core box shows ribbing and gate distribution.

with the zircon sand and rammed firmly around all contours of the master pattern. The zircon sand is mixed as follows:

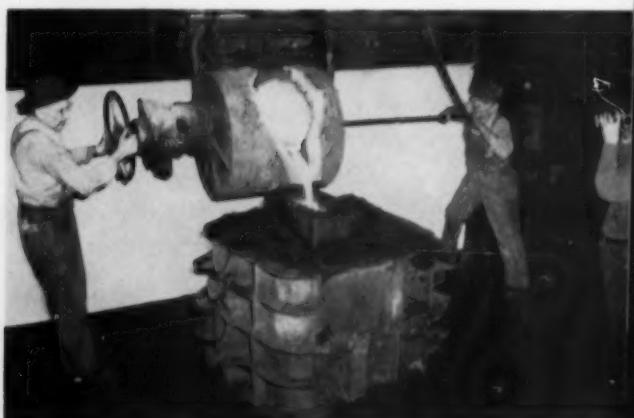
Zircon Sand	300 lb
Cereal	2 1/2 lb
Iron Oxide	6 lb
Clay	2 lb
Core Oil	3 1/2 pints
Water	3 1/2 pints

Mulling time is two minutes dry, two minutes with oil added, and two minutes with water added. Green compression is 1.3 psi; moisture is 1.5 per cent.

After zircon facing has been applied, any regular core sand that has approximately 1.5 psi green compression strength can be used as a backing sand. The mold is rammed solidly and struck off evenly before the bottom plate is bolted into place. The mold is



Setting lightener core into baked core mold.



Pouring temperature is standardized at 2500 F.

picked up with an air hoist, rolled over, and placed on the pin lift machine. Adjustable slides are provided on each side of the machine to allow for use of smaller or larger flasks. Hydraulic pressure is used to force the pattern out of the mold to eliminate any jerky motion.

Mold Baked in Day Oven

The mold is then placed on a car that is suspended from a monorail and moved into the day oven where it is baked at 350 F. The length of baking time is determined on the basis of one hour for each inch of sand in the flask. When the baked mold is removed from the oven it is allowed to cool to about 100 F and then coated by brushing the zircon paste core wash of 50° to 55° Baume on mold cavity. The baked molds and lightener cores are then sent to the pattern shop where they are given a dimensional check before being delivered to the foundry.

Where a cover core is used in making a pattern casting, the ingates are rammed up in the cover when making the core. The pencil type of ingate is used, made from either $\frac{1}{4}$ or $\frac{5}{16}$ -in. round dowels with a nail in one end to locate it in the wood master pattern. These pencil gates are generally placed about three inches apart around the outside flange of the casting or, if necessary, placed in the cross ribs. Purpose of this method is to introduce metal in an even flow to all parts of the mold simultaneously, thereby reducing any tendency toward cutting as well as controlling directional solidification throughout all sections of the casting. Where a cope and drag mold is used, the pencil gates are rammed up in the cope mold in the same manner as used in the cover core.

Ram Flat Back Green Sand Cope

Where the pattern casting to be made can be placed in the drag flask and a cover core-type lightener is used, the foundry rams a flat back green sand cope using wooden strips $\frac{1}{8}$ in. thick and 1 in. wide as a marker over the pencil gates for cutting the runner bars in the green sand. A sprue is rammed in place in the cope, and when the mold is closed a pouring basin is rammed over a strainer core. This completes this type of mold. When both cope and drag flask are rammed separately and baked, the gates are in the cope when mold is

closed and clamped. In this type of mold, runner bars are made by use of slab cores $1\frac{1}{4}$ in. thick placed to form a runner $1\frac{1}{4}$ in. wide and then covered with slab cores with a sprue hole drilled through slab where the pouring basin is to be located. Snap weights are used to hold the top slab cores in place as metal pressure is not great in the runners.

Molds are poured one up from a bull ladle. As all wall thickness of the pattern castings to be poured are uniform, either $\frac{1}{2}$ in. or $\frac{5}{8}$ in., pouring temperatures were established at 2500 F. After a mold is poured it is allowed to cool for 12 to 16 hours before shaking out.

Castings are then given a light sand blast, the pencil gates are knocked off, and castings are delivered to the pattern shop, where the mounting surfaces are machined, the bolting bosses removed and the face of the pattern casting is finished. Finishing the face of the pattern is accomplished by the use of emery cloth wrapped around a small tool and inserted in a small hand air grinder.

Surface wear on patterns cast and finished by this method has been greatly reduced.

Save Finishing Time

The time and cost of producing cast iron patterns from base iron is comparable with any jobbing casting made in the foundry. However, considerable time is saved in finishing. As an estimate of what the savings could be using this method, the following figures based on actual performance are given. A cope and drag pattern casting made with $\frac{1}{8}$ -in. finish by conventional methods required 382.2 hours of finishing time as compared to 68.5 hours finishing time when patterns were cast to size in zircon molds. In making a large rear axle pattern of cope and drag type using the precision casting method, the pattern was placed in production in the foundry in 145.1 hours as compared to over 400 hours required when made the conventional method. The cope section of a differential spider pattern required 200 hours finishing time made the conventional way as compared to 26 hours when precision cast.

Acknowledgement. The authors wish to express their appreciation for the invaluable assistance of W. R. Jennings in making this paper possible.



Checking pattern casting in the pattern shop.



Completed precision cast pattern mounted for use.



Cupola slag color is checked by on-the-job supervision before making a change in cupola operation.



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Belle City Malleable Iron Co., Racine, Wis.**

Two phase control by metallurgical staff and on-the-job supervision allows the Belle City Malleable Iron Co. to vary their cupola-air furnace operation from 80 to 310 tons melt per day and maintain melt quality.

■ Widespread adoption of the cupola-air furnace duplexing process for producing railroad grade or 35018 malleable iron has changed thinking concerning proper cupola operation. Two conditions have lead to this change of thought: the melting operation of this process is more oxidizing than melting gray iron or 32510 grade malleable iron and the metal requirements of a mechanized jobbing foundry can vary widely, even from hour to hour.

These two conditions make it necessary to place a greater share of metallurgical control responsibility in the hands of on-the-job supervision—the melting supervisor.

Duplex melting equipment at Belle City Malleable Iron Co. consists of two front slagging cupolas and two pulverized coal-fired air furnaces arranged so that either cupola can feed metal to either furnace. The 84 in. shell diameter cupolas are internally water-jacketed, and are lined down to 48 or 52 in. depending on melting requirements. Charging is done mechanically. Since the gun-type method of applying cupola lining has been adopted, changes in cupola diameter have been readily

accomplished. Air furnaces are of the bottom-ventilated design with a 20½-in. all-brick bottom.

At present each cupola is used on alternate days and each air furnace on alternate weeks. This sequence has been followed on a two 10-hr shift operating schedule producing 310 tons per day, as well as on a single 7-hr shift schedule of 80 tons per day. Equipment is designed for 15 tons per hour production.

The base cupola charge is 8 per cent malleable grade pig, 4 per cent silvery pig, 40 per cent steel scrap, and 48 per cent returns. Ferrosilicon briquets and silico-manganese briquets are used to adjust the charge composition to proper range. Fifty to 80 lb of limestone, along with a small amount of prepared flux, is used with a 2500-lb charge. The mean coke split used with this charge is 310 lb. The over-all coke ratio (including the bed coke) is about 7½ to 1.

Division of Control Responsibility

Control of the duplex operation can best be divided into two phases: metallurgical staff supervision and on-the-job supervision.

Phase One. The chief metallurgist, along with the plant staff, sets metal standards. Consideration is given to final product quality and expediency of manufacture.

It is the responsibility of the laboratory staff to make whatever checks are necessary to assure the purchasing

of materials of proper analysis and grade. In this phase of control, steel scrap is analyzed for chromium and other elements harmful to the manufacture of malleable iron castings. Close contact is maintained with local scrap dealers on materials coming into their yards because scrap is accepted or rejected before being cut. Scrap going into steel bundles is particularly watched at this point.

Metal at the furnace spout is analyzed each half hour for carbon, silicon, and manganese; results are reported in about 20 minutes. Phosphorous, sulphur, and chromium are checked every two hours.

Phase Two. It is the responsibility of the cupola-furnace supervisor to control carbon, silicon, and manganese content and temperature of metal delivered to the pouring stations. He has the authority to make temporary changes of almost any nature to accomplish this. Such flexibility assures product control under varying conditions of over-all operation.

Over-all operating conditions include: appreciable change in rate of metal demand per unit time, change in coke quality including the percentages of fines and moisture, variation in physical condition of steel scrap and sprue such as mean size and percentage of rust and earthy material, and delays in charging operation due to equipment maintenance. At times these occur accumulatively, making very drastic adjustments necessary in order to keep cupola operation within the proper oxidation-reduction range.

Although no combustion control equipment other than air weight control of blast, is used on the cupola, stack gas analyses have proven that normal cupola operation is very good.

In operation, on-the-job cupola control starts with cupola slag color which is maintained slightly on the

green side of the change from black to green. Slag color is principally a function of coke bed height in relation to blast volume and is controlled by adjusting the amount of coke going into the cupola. Other factors affecting slag color are cleanliness of charge and charge permeability; increasing the coke charge can compensate for extra rusty metal or charges of small metal pieces.

Color Observation Made

Color observation is made of slag from the front slagging cupolas which has been granulated in a water-flushing-separation tank system. It is both convenient and suitable to judge the color of slag removed from the separation tank in controlling cupola operation.

Cupola metal temperature (2800 to 2850 F) is a second point of control, but changes in cupola operating conditions are usually indicated first by a change in slag color. Wind box pressure and trends of analysis changes at the air furnace spout also aid the melting supervisor in judging the condition of cupola metal. When the cupola operation is held on the slightly reducing side, the melting supervisor can control the analysis of metal at the air furnace spout within the prescribed range.

Quality control charts of analysis at the furnace spout have little value in controlling the cupola operation, principally because control measures must be exercised previous to the time indicated by average trends. Because it takes from two to six hours for charged material to affect analysis at the furnace spout, it is extremely important to evaluate changing factors as the melting operations progress and make corrections as early as possible.

Make Frequency Distribution Analysis

Analysis frequency distribution curves are determined each month for each melting supervisor. At a conference of each supervisor with the melting department head, the previous month's distribution charts are discussed and full attention is given to matters seemingly beyond the control of the supervisor. These conferences, when properly conducted, instill a friendly spirit of competition which leads toward more uniform operation and higher quality.

To be able to anticipate and evaluate the degree of effect of any variation in the melting process is the greatest attribute of good control supervision.

Metal temperature is verified by immersion thermocouple.

Mean Charge Composition for Duplexing Cupola								
Material	Total		Carbon		Silicon		Manganese	
	%	lb	%	lb	%	lb	%	lb
Malleable Pig	8	200	4.00	8.00	2.00	4.00	0.80	1.60
Silvery Pig	4	100	2.00	2.00	10.00	10.00	1.00	1.00
Steel	40	1000	0.20	2.00	0.15	1.50	0.50	5.00
Hard Iron								
Sprue	44	1100	2.35	25.85	1.10	12.10	0.50	5.50
Malleable	4	100	2.00	2.00	1.10	1.10	0.50	.50
Mn-Si Briquets	(4 pc)					2.00		8.00
Si Briquets	(4 lb)					4.00		
Total, lb	2500		39.85		34.70		21.60	
Elements Charged, %	1.59		1.39		0.86			

Analysis charts are discussed by melting staff.



Vapor Holes from Loose Sand Grains in Brass and Bronze Castings

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Copper-base alloys can be poured as low as 1800 F without resultant vapor holes, say the authors, provided you make a perfect mold with no loose sand. Written discussion of this paper, Convention Preprint No. 55-1, should be sent to American Foundrymen's Society, Golf & Wolf Roads, Des Plaines, Ill. The paper is one of six to be presented at the Brass & Bronze sessions of the AFS Convention in Houston, May 23-27, 1955.

■ Vapor holes that show up in brass and bronze castings at various times from loose sand grains entrapped during solidification are discussed below. These have no relation to holes caused by metal boiling in the mold; from overheating and gassing of metal, or where oxygen in the metal combines with vegetable matter in the molding sand and carbonaceous material in the cores.

It has been known for many years that maximum density in brass and bronze castings is obtained by pouring metal at the lowest practical temperature. Most foundrymen know, however, that by pouring metal at lower temperatures they often get vapor holes from loose sand grains that are held within the metal of the casting itself. It seems to make little difference whether the mold be made of green sand, baked, or composed of built up cores.

The authors are endeavoring to establish here the pouring temperatures at which the metal will and will not free itself from these sand inclusions. When casting hot, fluid metal, the loose sand in the mold is forced out of the liquid to the surface of the casting where it can be cleaned off. When casting cold dull metal the sand particles are held within the metal and the associated water and vegetable matter, clay, etc., held by the grains themselves is liberated within the casting.

While moisture in a sand grain is small it expands thousands of times in volume at 1800 F and when encased within the metal, it creates enormous pressures of many thousands of pounds per square inch. The

volume, pressure, and resistance finally equalize themselves, leaving a hole in the casting.

To establish the amount of moisture, etc., held in sand grains several analyses of sands were made.

First test was made on a 100-mesh Tennessee molding sand containing 20 per cent clay. After drying out the 6 per cent working moisture, the sand was further dried for 24 hours at 230 F. Then it was carefully weighed and the temperature raised to 1800 F for one hour, resulting in a 2.34 per cent loss in weight. The experiment was carried into the fourth hour with no appreciable additional loss. The 2.34 per cent loss was considered to be due mostly to the water held by the 20 per cent clay. Vegetable matter was not determined.

Next experiment was to wash out the clay and vegetable matter from the same sand, and run the sample again. This corresponds fairly well to washed core sand. This sample was then dried thoroughly for 24 hours at 230 F. Heating at 1800 F for one hour gave a 1.33 per cent loss in weight. The sample was kept in the furnace for three more hours with no appreciable change in weight.

There are different opinions on the formation of the

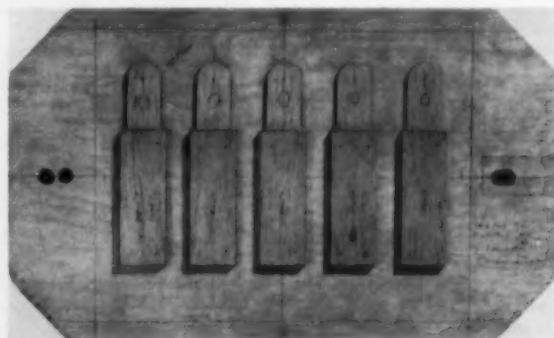


Fig. 1 . . Sand inclusion test pattern's five cavities will be poured separately at different temperatures.

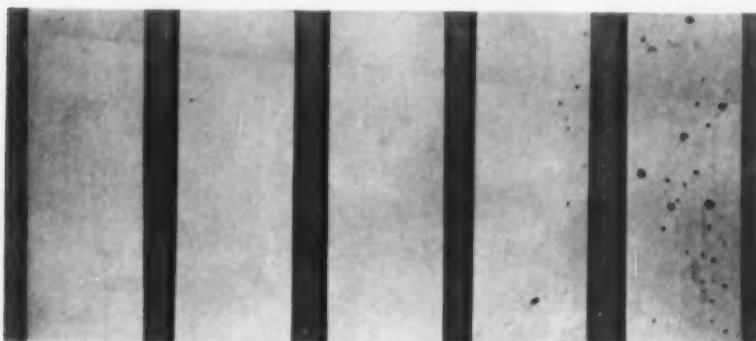


Fig. 2 . . Each set of five machined test castings was poured, L to R, at: 2200, 2100, 2000, 1900, 1800 F. Sprue bottoms of these were left ragged.



Fig. 3 . . Molding sand grain from sprue caused this hole.

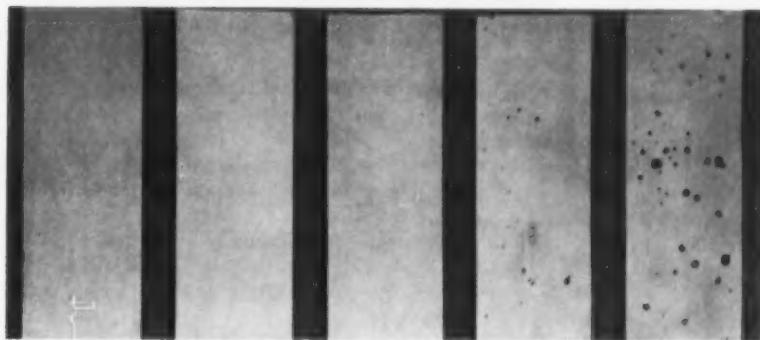


Fig. 4 . . One gram of dry molding sand was placed in each runner.

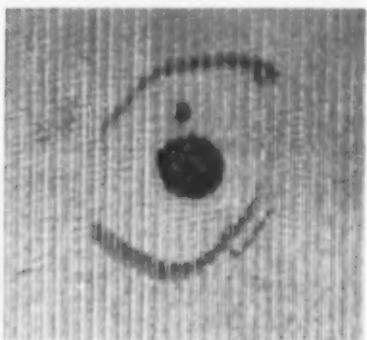


Fig. 5 . . Sand fragments in hole.

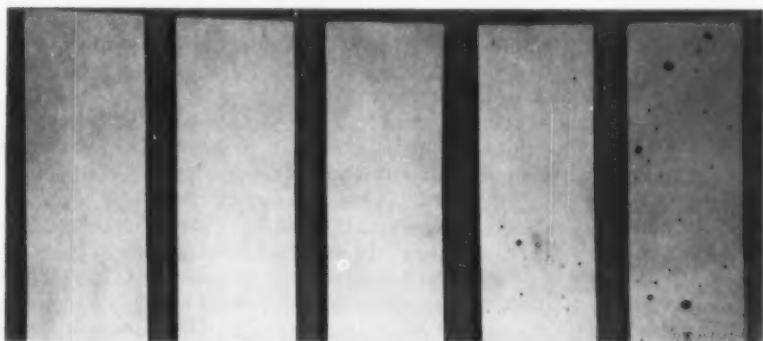


Fig. 6 . . Dry core sand in runners produced similar results.



Fig. 7 . . Hole with sand inclusion.

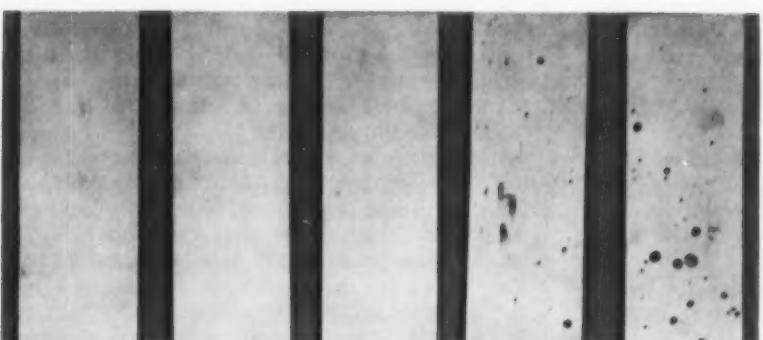


Fig. 8 . . Even dried silica sand resulted in vapor holes in casting.

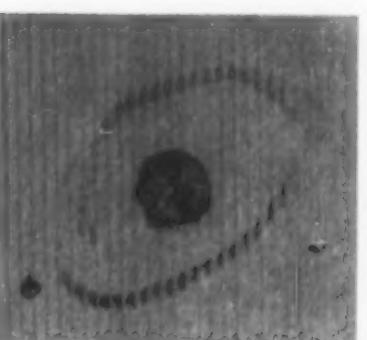


Fig. 9 . . Silica residue in hole.

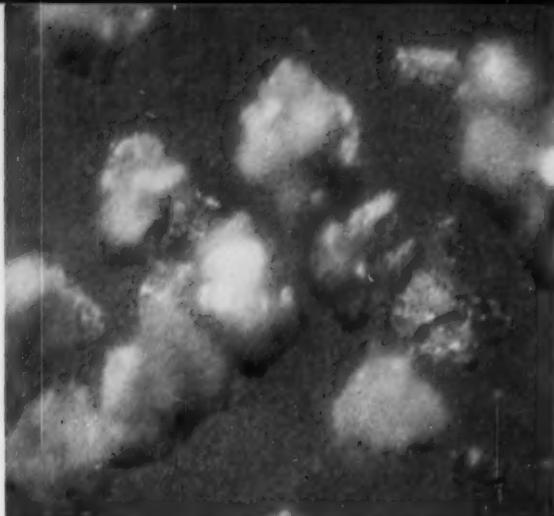


Fig. 10 . . Fine particles of shattered sand grain.

granite from which natural molding sands come. Some consider it an igneous rock and free of moisture, and others metamorphous formation. To determine whether it contained volatile material, the authors took a sample of granite, crushed it, and dried it thoroughly at 230 F for 24 hours. After this drying period, raising the temperature to 1800 F gave a 0.91 per cent loss in weight. The temperature of 1800 F was maintained for three more hours with only 0.05 per cent additional loss of weight.

The next experiment was with washed silica sand. This was dried at 230 F for 24 hours, then held at 1800 F for one hour, showing only 0.27 per cent loss in weight. The heat was continued for three more hours, with only 0.004 per cent additional loss.

Silica sand is of a different formation than granite-formed sand, and is thought to carry no water. The authors believe that the loss of weight in all tests is mostly moisture which is not considered to be a part of the crystal formation, but to be held in fine cracks and interstices.

To test these findings in actual practice a pattern was made (Fig. 1) with five $1\frac{1}{2}$ x 2 x 6-in. castings and poured each at varying temperatures (2200 F, 2100 F, 2000 F, 1900 F, and 1800 F) under different conditions. All molds were made with regular 20 per cent clay, 100-mesh Tennessee molding sand. The sprue hole in the first mold was cut with a $1\frac{1}{4}$ -in. diameter tube as standard practice, with the ragged sand edges left on the bottom of the sprue. The castings poured at 2200 F, 2100 F, and 2000 F showed sand inclusions, but these were strictly surface defects which machined out with a $\frac{1}{2}$ -in. cut. Those poured at 1900 F and 1800 F contained vapor holes. Figure 2 shows the castings made in the first mold. Figure 3 is a photomicrograph of one of the holes, and the residue of the sand grain that caused it. All the holes are similar.

On the second mold the sprue was smoothed out but 1 gram of dry molding sand was placed in the runner and washed into the castings. This sand showed up on the surfaces, but machined out perfectly. The metal poured at 2200 F, 2100 F, and 2000 F had enough fluidity to produce good castings by floating the loose sand to the outer surface. The metal poured at 1900 F and 1800 F did not have sufficient fluidity to free itself of the sand inclusions, and vapor holes resulted.

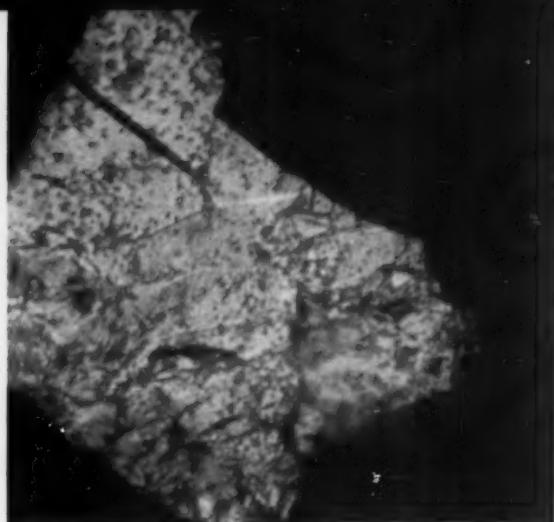


Fig. 11 . . Vapor may be from fine cracks in grain.

Figure 4 shows the results of the second test; Fig. 5 is a photomicrograph of one of the holes showing the residue of the sand grain that caused it.

Figure 6 shows the results of the third mold. This mold was poured in the same manner as No. 2, except that 1 gram of dry core sand was placed in each runner with the same final results. Figure 7 is a photomicrograph with the sand inclusion, the same as before.

Figure 8 shows the results of the fourth mold. This was made the same as No. 2, except that 1 gram of dry silica sand was placed in each runner. Figure 9 is a photomicrograph of one of the holes with the residue of the silica grain that caused it. All holes are similar.

Molds 1, 2, 3, and 4 were all cast from 85-5-5-5 red brass. The metal was heated to 2200 F in a No. 80 crucible oil-fired furnace, and flushed with one half pound of zinc, plus $1\frac{1}{2}$ ounces of phosphor copper shot per 100 pounds. Fracture tests show the metal to be of excellent quality.

The black residue shown in the holes of the macrographs has been examined and found to be finely divided shattered sand particles, originally sand grains.

Figure 10 is a photomicrograph showing a group of these shattered particles. Magnification is 100 diameters. The top of the shattered particles appear rounded in the picture as it was not possible to bring all the surfaces into focus at one time. Figure 11, a photomicrograph of a single dust particle magnified 500 diameters, shows the fine cracks and interstices believed to be the source of vapor in the original grain.

The authors do not know whether it is the rapid expansion of moisture that burst these sand grains into dust-like particles by creating an explosion or whether they are caused from heat shock. They lean toward the explosion theory because the surfaces of the holes appear black from finely divided dust particles imbedded in the metal.

It is the opinion of the writers that even though metal is poured at a high temperature, vapor holes often show up in certain castings because the metal is chilled while filling the mold cavity to the point where it cannot free itself of loose sand grains. They believe, however, that metal can be poured into a mold at 1900 F and 1800 F without developing vapor holes, provided a perfect mold, with no trace of loose sand, is made.

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Bottom-Pour Ladle Practice

Safety, economy, and higher pouring temperatures resulted from this study of steel ladle practice. Written discussion of this paper, Convention Preprint No. 55-121, should be sent to American Foundrymen's Society, Gulf & Wolf Roads, Des Plaines, Ill. The paper is one of 14 to be presented at the Steel sessions of the AFS Convention in Houston, May 23-27, 1955.

■ Melting units at the Indiana Harbor Works of American Steel Foundries were two acid 8-ton, top-charge electric furnaces. A rammed ganister ladle lining gave excellent service—up to 60 heats per lining. Over a period of time the furnaces were converted to basic practice necessitating changes in ladle practice.

Three different types of ladles were in service—8-ton capacity conical-shaped ladles and 8-ton and 10-ton capacity cylindrical-shaped ladles. Although the ladles were of different design and size, the slide mechanism was interchangeable. The average life of ladle linings was less than 15 heats. Refractory failure was usually due to excessive erosion extending about two feet up from the bottom or between the brick joints.

A survey had been made on the factors affecting lining erosion. Factors which were found not to affect lining erosion were manganese-silicon ratio of the metal, length of ladle service, metal tap temperature, and length of time teeming molds. The only factor found to affect ladle erosion was length of time that the slag blanket remained at a constant level. From this investigation the practice of dumping the slag from the ladle immediately after teeming was instituted. Previously the ladle was placed on a transfer car and the slag disposed of on the other side of the foundry. This immediate slag removal seemed to be helpful by preventing excessive refractory erosion near the bottom.

The ladles were lined with 6-in. cupola block. One course of block was laid in with an air-setting high-temperature cement and the ladle was then dried under a gas fire. With three differently designed ladles, cupola blocks did not fit very well and a considerable amount of buttering of the joints had to be done. This created a point of quick erosion. On occasion the metal would erode between a joint and through the ladle shell into



Permanent shell lining is in place and working lining has been started. Slurry of fire clay prevents linings from sticking together. Experiments are continuing to develop best possible lining and nozzle practice.

the furnace pit. At least one heat was lost this way.

Practice was to lay a flat brick bottom into the ladle and then ram a proprietary graphite-base ladle-bottom mix about three inches thick. There was no pitch to the bottom. The ramming material was rammed up the side of the ladle about six inches in an effort to reduce the amount of erosion on the side walls above the bottom. This was then smoothed over with a pasty bottom mix. Since the ramming mix would not adhere to the side walls, it would then erode away in patches or the metal would get under and form a skull. Bottoms were usually replaced after about six heats. Some castings were being scrapped for slag inclusions which were due in part to this bottom practice. On occasions, a carbon pickup was noted in some heats. This pickup in carbon was also due to the bottom ramming practice.

When erosion occurred at the cupola block joints, the hole was filled with the ramming material and covered over with high-temperature cement; these patches did not hold very well. The only other patching

was to attempt to ram the bottom up the sides of the ladle when erosion reduced the lining thickness.

No attempt was made to control the slag depth on the ladle. The ladles were so large that all of the slag in the furnace would be carried on the heat after it was in the ladle.

The only mortar used was an expensive air-setting, high-temperature cement. This material was also laid on top of the ladle to prevent slag and metal from sticking to the ladle shell.

As the established practice was unsatisfactory, experiments were outlined to develop a better ladle lining.

First considerations were for safety and prevention of metal losses. This could be accomplished by a double lining. On the small 8-ton ladles, a 2-in. shell lining and a 4½-in. side arch fire clay brick were used to replace the single cupola block. With a double lining the metal may go through one course but with staggered joints, it would go no further. With a 2-in. shell lining, a better idea of depth of erosion could be obtained. When the arch brick eroded to the shell lining, a patch could be put in or the working lining taken out and replaced.

The shell lining was put in to be permanent. In relining, only the arch brick would be replaced. Two-inch splits were laid up with high-temperature air-setting cement. This shell lining was then covered with a slurry of fire clay. The fire clay would prevent the two courses from sticking together and allow easy removal of the arch lining when necessary. With the larger 10-ton ladles, a 2-in. shell lining was used with the cupola block being used for the working lining. This was done originally in an effort to use up material on hand, but the cupola blocks fit the circle very well and gave good service. The 10-ton ladles were the straight wall cylindrical type.

In laying up the arch brick lining, the bricks were dipped into a wet mixture of fine chrome ore and fire clay. No cements were used for the working linings. A mortar of fine chrome ore and water was mixed for the bed joints between the rings and for setting in the cupola blocks. Fire clay was spread on top of the ladle to prevent metal and slag from sticking to the metal ring at the top.

The brick bottom was sloped towards the nozzle opening with a three-inch pitch. On top of the brick, about 2½ in. of the regular proprietary bottom mix was hard rammed, taking care not to go up the side walls.

When erosion developed on the brick lining near the bottom, a brick patch was put in around the ladle; 2½-in. brick and 2-in. splits were laid in with plastic chrome ore. The patches held up well. The practice of brick patches was instituted as standard procedure for repair. This eliminated the building up of bottom material along the side walls.

On new ladles, the lip is adjusted so that about four inches of slag is carried on top of the heat for insulation. Due to design, no further adjustment can be made; so for at least half of the ladle life, some of the slag is drained off of the ladle into the pit. It is felt that in reducing the amount of slag, the severity of erosion will be reduced at least for part of the ladle life. The

addition of brick patches also increases lining volume so that additional slag may be drained from the ladle after patching.

Results of these changes in practices were quite gratifying. The changes in bottom practice resulted in the elimination of skulls. The bottom material was rammed flat to the pitch of the brick, not up the side walls. No metal could get under the rammed material and form a skull. Once the rammed bottom material was well fused, carbon pickup in the metal was eliminated. There were no patches of bottom material to be pulled away from the side walls allowing the graphite to dissolve in the metal. With this practice only half the ramming time was required to install a bottom and the life of the rammed bottom increased from six to 12 heats. It is felt that with the sloped bottom, better drainage will result and slag inclusions in the castings reduced.

Material cost of a 2-in. shell lining is about \$46.60. Two hundred 2-in. splits are used along with one drum of high-temperature cement. This safety lining will remain in the ladle when the working lining is removed. In a cost comparison of the different ladle linings, this safety shell will not be included as it is expected to last about a year.

Indications are that ladle lining life should approach 20 heats with 6-in. cupola block. With 4-in. side arch, lining life should be close to 15 heats on the smaller ladles. One 10-ton capacity ladle was taken out of service after 20 heats due to lining erosion. The working lining was easily removed and the rammed bottom taken out within one hour. This compares to four hours labor without the inner shell lining. The working lining was replaced, bottom rammed and a heat tapped into the same ladle within 24 hours after the last heat was taken in this ladle. About three hours was all that was required to replace the working lining, two hours to ram a new bottom and 10 hours preheat.

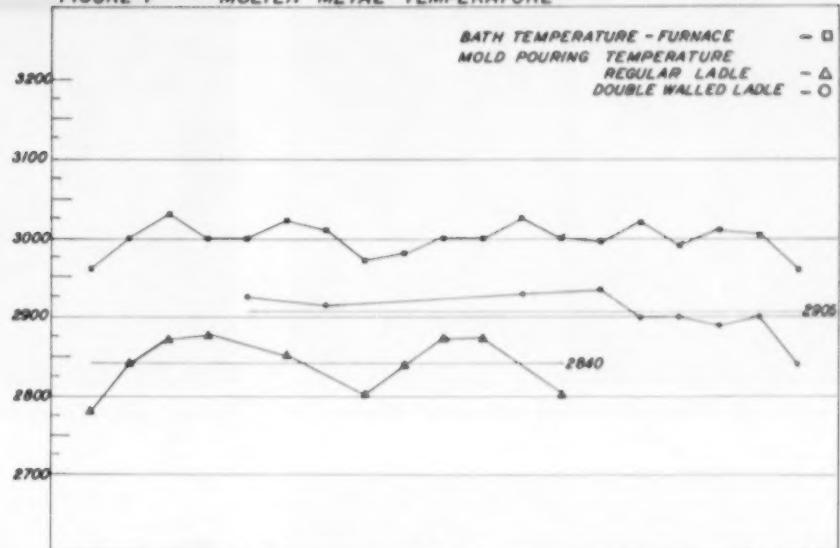
One small ladle was taken out of service after 14 heats due to erosion of the 4-in. fire clay arch brick. This ladle was relined in about three hours and returned to service the following day. Fire clay and chrome ore have been substituted for the expensive high temperature cement.

Table I is a cost comparison of materials only for the different methods of ladle lining. This cost is for the working lining only. With the old single 6-in. lining, material costs were \$7.17 per heat. With the present double-wall lining, the cost per heat has been cut in half. Even after the first run, the safety shell lining has paid for itself. Four experimental linings are also listed; three of rammed material and one bloating brick lining. The rammed linings were expensive and did not give sufficient service to justify the expense; the bloating brick was cheaper per heat but did not give sufficient service to justify the labor involved in frequent relining.

In addition to material savings, labor costs have also been reduced due to the change in practice. Since the institution of the new ladle practice, there have been no metal losses. The economy of safety by the use of a double lining is self evident.

Perhaps the most unusual result of the double-walled ladle practice was the change in level and range of metal

FIGURE 1 MOLTEN METAL TEMPERATURE



Temperature readings made during period of ladle changes show reduced heat losses in double walled ladles.

pouring temperatures. The basic heats are tapped directly from the tilting furnace into the ladles. Tapping temperatures are measured with an immersion radiation pyrometer. Pouring temperatures were taken with Pt-Pt 10% Rd thermocouples. With the single-walled ladles, the tapping temperature range for Grade B steel was 3020-3050 F. This resulted in a pouring temperature of 2780-2885 F a range of 105 F. The loss from the furnace to the pouring cup ranged from 100 to 200 F. With the introduction of the double-walled ladles, pouring temperatures increased 70 F. The loss from the furnace to the pouring cups was reduced to 70-120 F.

The chart is a series of readings taken during the period of change in ladle practice. Tapping temperature had been reduced 20 F to a range of 3000-3030 F. With the single-walled ladles, the average pouring temperature is 2840 F. With the double-walled ladles, the average temperature is 2905 F. The last five readings on the chart were taken from the last five heats in a ladle before the working lining was removed for repair. This was expected to give maximum temperature loss from furnace to pouring cup. In addition to this, pouring temperatures were taken at the beginning of pour and at the end of pour—over 100 openings; pouring temperatures varied only 15 F.

At present, tap temperatures range has been reduced another 30 F—2970-3000 F. Pouring temperatures average close to 2850 F. Better refractory life at the furnace is to be expected due to the lowering of temperatures. This would indicate that a good ladle practice is not only reflected in reduced costs of material and labor for ladles, but also is the control of other variables.

Although a workable ladle practice had been established, it is believed better can be developed. Experimental work has been planned to evaluate many new practices. This includes:

1. Nozzles of different designs and materials.
2. Ladle design to give very low ferrostatic pressure.
3. Nozzle insertion from outside the ladle.
4. New ramming materials.
5. The relation of refractory tests to performance.

Methods and Cost of Ladle Linings

	Material	Quantity	Cost	Lining Thick-ness	Ave. No. of Heats	Mat'l. Cost Per Heat
Old Method	6" Cupola Block	250 lb	\$ 68.75			
	Fire Clay Arch	54	6.48			
	High-Temp. Cement	200 lb	25.20			
Present Method 10-Ton Ladies			\$100.43	6"	14	\$ 7.17
	6" Cupola Block	200	\$ 55.00			
	Fire Clay Arch	54	6.48			
	Chrome Ore	200 lb	4.60			
Present Method 8-Ton Ladies	Fire Clay	100 lb	1.22			
			\$ 67.30	6"	20	\$ 3.36
	Super-Duty Fire Clay	270	\$ 59.40			
	Chrome Ore	100 lb	2.30			
Exptl. 8-Ton Ladies	Fire Clay	100 lb	1.22			
	Bloating Arch Brick	385	\$ 31.57			
	Chrome Ore	100 lb	2.30			
Exptl. 80% Alumina Ramming Mix	Fire Clay	100 lb	1.22			
			\$ 35.09	4"	9	\$ 3.99
	Fire Clay Arch	54	6.48			
Exptl. Sillimanite Ramming Mix			\$428.40			
	Fire Clay Arch	54	6.48			
			\$434.88	4"	19	\$22.88
Exptl. Basic Magnesite			\$320.00			
	Fire Clay	4800 lb	\$192.00			
Exptl. Fire Clay Arch			850 lb	10.37		
			54	6.48		
				\$208.85	6"	\$20.88

The use of a flat graphite mold and a graphite pouring cup gives a good picture of the extent and occurrence of refractory inclusions due to erosion of the ladle and nozzle. A few of these castings, will readily indicate the quality of ladle practice. From these castings, inclusions can be identified, analyzed, and classified as to origin. It is hoped that through this program, metal can be delivered to the pouring cup as chemically analyzed and free from foreign material and refractories.

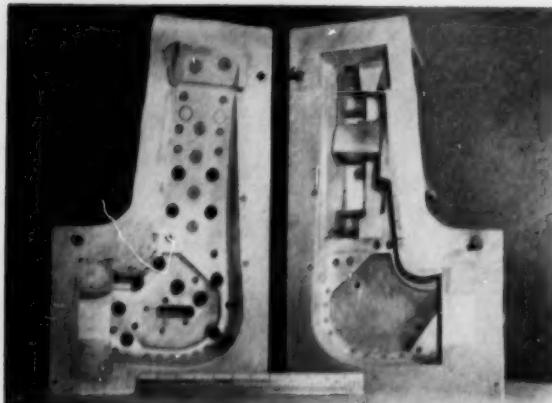


Fig. 1 . . Box to be used to make rubber-lined core box.

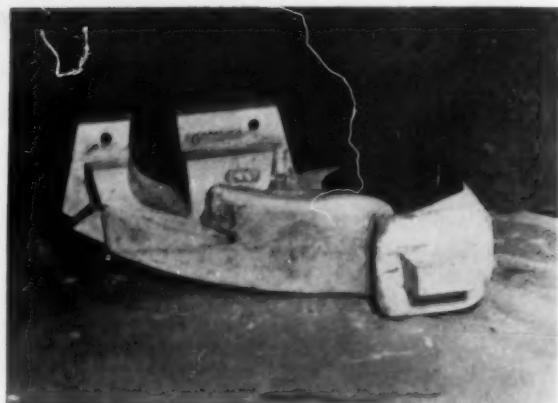


Fig. 2 . . Plaster plug will form rubber lining for box.

Make Plaster Cores in Rubber-Lined Boxes



ROBERT F. DALTON / Project Engineer
Foundry Dept., Hills-McCanna Co., Chicago

Rubber-lined core boxes are preferable for forming plaster cores. Boxes can be easily and inexpensively made using existing equipment. Written discussion of this paper, Convention Preprint No. 55-152, should be sent to American Foundrymen's Society, Golf & Wolf Roads, Des Plaines, Ill. The paper is one of three to be presented at the Plaster Mold Casting sessions of the AFS Convention in Houston, May 23-27, 1955.

■ Rubber-lined core boxes for plaster molding have several advantages and a few disadvantages. These are:

Easy and Economical to Produce. Making plaster cores with their relatively slow turnover (seven to 30 min in the core box) requires that core boxes and pattern equipment be relatively inexpensive and easy to reproduce. Depending on the production requirements, it may be necessary to have from five to 25 times the number of core boxes usually needed in sand in order to produce a sufficient number of cores for plaster molding.

Since the production of rubber-lined core boxes is a pouring operation rather than a tool room or machine shop operation, the duplication of core boxes is relatively inexpensive. Due to the high green strength of plaster, core driers are not needed.

Separator Is Not Required. In core boxes of wood,

metal, plaster, or plastic, a separator or parting agent is applied to the box before the plaster is poured. With rubber-lined core boxes this operation is unnecessary. The application of separator is not particularly difficult, but frequently trouble is encountered due to the uneven application of separator. This is especially true in foamed plasters where the liquid carriers frequently used in separators are foam breakers and tend to give poor surfaces to the plaster core.

Back Draft May Be Incorporated. Because of the flexibility of rubber, the core box may be designed to include no draft and even back draft. In rigid core boxes this is only accomplished by irregular parting lines, loose pieces, etc., resulting in complex, expensive core boxes. The advantage of rubber lined core boxes is further emphasized when one considers that loose pieces may result in fins, parting lines, and irregularities on the finished casting.

Size Control. The problem of rubber shrinkage has not been completely solved. Whether the so-called "rubber" materials are poured hot or cold they are susceptible to change in size due to evaporation of plasticizer, humidity changes, etc. Rubbery substances of this nature are inherently less stable than rigid materials like metal, plastic, or plaster. Wood, although the most widely used material in the foundry industry for core



Fig. 3 . . Clay over plug determines rubber thickness.

boxes and pattern equipment, is also unstable due to change in shape from shrinking and swelling.

The formulations of the rubber-like materials are constantly refined so that less difficulty may be expected in the future. In the meantime, if a flexible pattern or core box has shrunk beyond usable size, another one of the proper size would have to be produced and used in production.

To convert a particular sand core to a plaster core, it may be advantageous to use existing equipment to make the rubber-lined equipment. This eliminates the need for the original master core box or the master plug core from which the original core box was made.

Figure 1 shows the existing core box which consists of a split aluminum blow box with a nearly even parting line, two loose pieces, two through-the-box brass rods, and two brass plates that locate three vanes that are engulfed by the sand core but will be cast into the plaster core. The core box offered the disadvantage of being used in a core blower, hence the only openings into the box are the sand entrance holes and the vent holes. All of these holes are too small to pour a foamed plaster mix through, hence even if rubber-lined boxes were not used, the existing equipment could not be used to make plaster cores without alterations.

Making the Master Plug. A liberal coating of lacquer and separator were applied to the box interior. The core box was then partially filled with plaster; with care taken to cover all interior surfaces of the box, but not necessarily to fill the two halves full. When the plaster was stiff enough, the box was booked and the interior filled through a previously made opening (one of the blow screens was removed for this purpose).

The completed plaster plug is shown in Fig. 2. Although the plug will show disconfigurations from the various blow and vent holes, it may be "pointed" with more plaster to fill in depressions and scraped to remove fins, flash, etc.

To accurately align the three vanes in the core box, the brass plates of the original aluminum core box were incorporated as a part of the plaster plug. It is quite evident from Fig. 2 that there is a considerable amount of back draft in the hole on the upper left side of the plug. When the master plug has been completed it is soap-shined to a very high polish and the desired parting line is scribed.



Fig. 4 . . Plaster-soaked fiber reinforces clay layer.

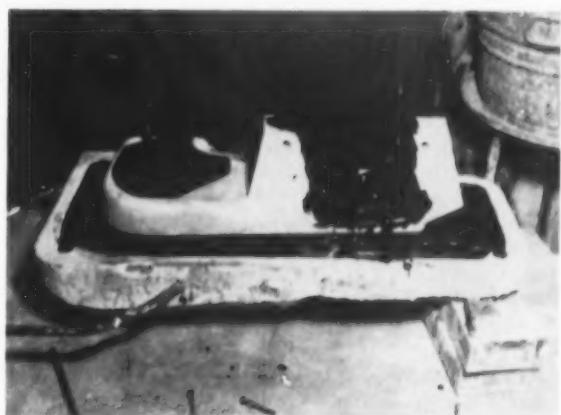


Fig. 5 . . Rubber paint on plug insures smooth surface.



Fig. 6 . . Pouring rubber mixture into well-ventilated mold.

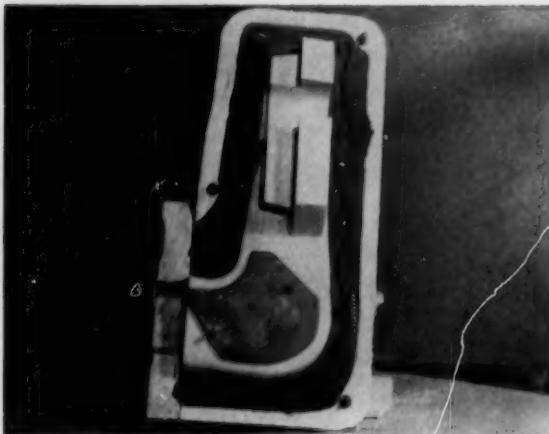


Fig. 7 . . Halfway through—rubber drag is next.

Making the Parting. To make a split rubber-lined core box (called a French mold in the plaster trade), it is necessary to determine accurately the parting line and make a base or plateau of rigid material (in this case plaster), so as to form a base against which the rubber may be cast. This is similar to the parting formed by a matchplate. If half of the original core box is in acceptable condition, the master plug may be set back into the box and the parting surface of the box extended some 4 to 5 in. by some suitable method such as using fitted wood pieces or plaster. The master plug is then accurately located or buried to its proper parting line.

If no equipment is available, it is advantageous to make a core plug which is the opposite of the desired core box. This plug may be made of conventional pattern materials with a high degree of accuracy and less expense than a master core box. In any event, in production of rubber-faced equipment, the work always proceeds from the core plug, whether it be produced from an existing core box or is made as an original core plug. For a description of the core plug see Mathias.²

Determining the Rubber Thickness. Strips of water clay, $\frac{1}{2}$ in. thick, are laid over the exposed portion of the master plug (Fig. 3). This volume of material will later be occupied by the poured rubber, hence the $\frac{1}{2}$ in. of clay will be $\frac{1}{2}$ in. of rubber. The clay layer is carried down to and extended out along the parting line a distance of $1\frac{1}{2}$ to 2 in. If the pin and bushing locations are satisfactory in the original equipment, these same locations may be transferred to the rubber-lined box. However, pins and bushings are generally located in the rigid plaster backing rather than the flexible rubber.

The two loose through-the-box brass pins of the original equipment are incorporated in the master plug and surrounded by clay, as shown in the illustration. This helps hold the rubber against the plaster cast to form an accurate foam-plaster core.

Casing the Mold. The completed clayed-up surface is splashed with a plaster mix and reinforced with sisal fibre well saturated with plaster (Fig. 4). This will be the case through which rubber will be poured. The

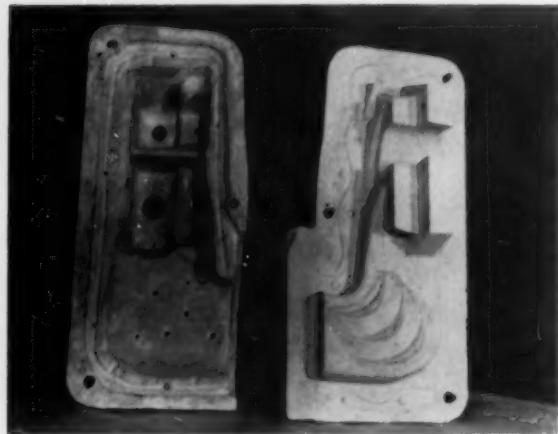


Fig. 8 . . Drag pouring case, left; plaster plug, right.

case is accurately aligned with pins and bushings to the parting line plaster, so it may be replaced in a later operation. The case is separated and the clay layer is removed. The model is thoroughly cleaned and given another soap shine, if needed. A parting agent is produced to be applied to this surface and to the back side of the case.

To eliminate surface defects, a small amount of rubber is mixed in a disposable paper cup and painted over the pattern (Fig. 5). This is an important operation, as it eliminates air bubbles and other discontinuities on the rubber surface.

Pouring the Rubber. The plaster case is repositioned accurately over the parted plaster plug and clamped, and the rubber mixture is prepared. Rubber is a misnomer as this material is a polymercaptop and is formed by mixing proper proportions of three liquid components. Directions for mixing are obtainable from the rubber supplier.

Figure 6 shows the rather long sprue through which the rubber is poured. Note the two through-the-box brass rods that are now transferred to the case mold. Numerous vent holes should be drilled into the case to avoid air pockets.

After the rubber has set overnight, the case, rubber, and plaster master plug are removed as one unit from the parting and the metal core box (Fig. 7). Half of the master plug has now been encased with rubber. Another parting to be made that is not in the original aluminum blow core box may be seen in the left portion of Fig. 7. Since the original blow holes did not present a large enough opening to pour the foam-plaster mix, another parting is made on the flat surface to the left of the corner to provide access.

The buttons and snake-like contour on the rubber at the parting line effectively hold the two rubber parts together on booking to form a foam plaster core with a minimum of flash at the parting line.

The clay, case, and rubber-pouring operations are again repeated to form the other two parts of the box. In general, the plaster cases used at the time the rubber is poured are not used in actual production of foam-plaster cores. After each rubber section is poured, the case is removed without disturbing the rubber from



Fig. 9 . . Matched halves and cover of rubber core box.

the master plug and a low-expansion, sisal-resin reinforced plaster case is made.

Making Multiple Core Boxes. To expedite the production of similar duplicate core boxes, a plaster cast is made of each half of the rubber extending over its parting. With the pouring case shown at the left of Fig. 8 and the parted half core on the right, it is a simple matter to make duplicates by pouring rubber through the case engulfing the half-core and forming at the same time, the rubber parting surfaces. In this manner, any number of duplicate core boxes may be produced.

The finished rubber-lined core box shown in Fig. 9 consists of the matched halves and a cover box (center) to form the core print. Note that the loose brass pieces holding the three magnesium vanes (not shown) are incorporated into the rubber. This is done by positioning the brass pieces on the master plug half before pouring the rubber. Note also the two through-the-box brass rods to help support the rubber in the case. In actual use, the two large halves are booked and foam plaster is poured into the rather large opening (about 4 in. square) before the third part of the box is added. The third part or cover of the box is set in place and the remainder of the core is poured.

The cover of the box forms a core print. Accurate alignment with the rest of the core is required and accomplished with pins and bushings in addition to the snake-like valley at the parting. The smoothness of the rubber face is very important in plaster work as the smoothness of the casting can only be as good as the foam-plaster core against which the metal is cast.

An example of tooling for metal casting plaster work is shown in Fig. 10, a portion of a tire mold core box with a rubber insert. Note the degree of back draft that may be had with flexible rubber core box materials. In actual use, the rubber insert is removed from the rest of the core box and kept in contact with the foam-plaster core. When the plaster has set sufficiently the rubber is removed gently by starting at one end of the core. The same shape core box insert in metal would be expensive to make and require about five loose pieces. Since each loose piece results in a joint and flash, it is rather easy to see the advantage of using rubber.

The material used in the rubber core boxes described in this paper is a cold-setting multi-component



Fig. 10 . . Rubber insert in tire mold core box section.

rubber, not a synthetic glue material that is heated prior to pouring, such as a plasticized polyvinyl chloride plastic.

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1. R. B. Wagner and J. E. Wiss, "Cold-Formed Flexible Precision Patterns and Core Boxes," *TRANS. AFS*, vol. 58, pp. 675-679 (1950).
2. James N. Mathias, "Core Boxes from Core Plugs," *TRANS. AFS*, vol. 60, pp. 466-469 (1952).

Technical Committee Openings

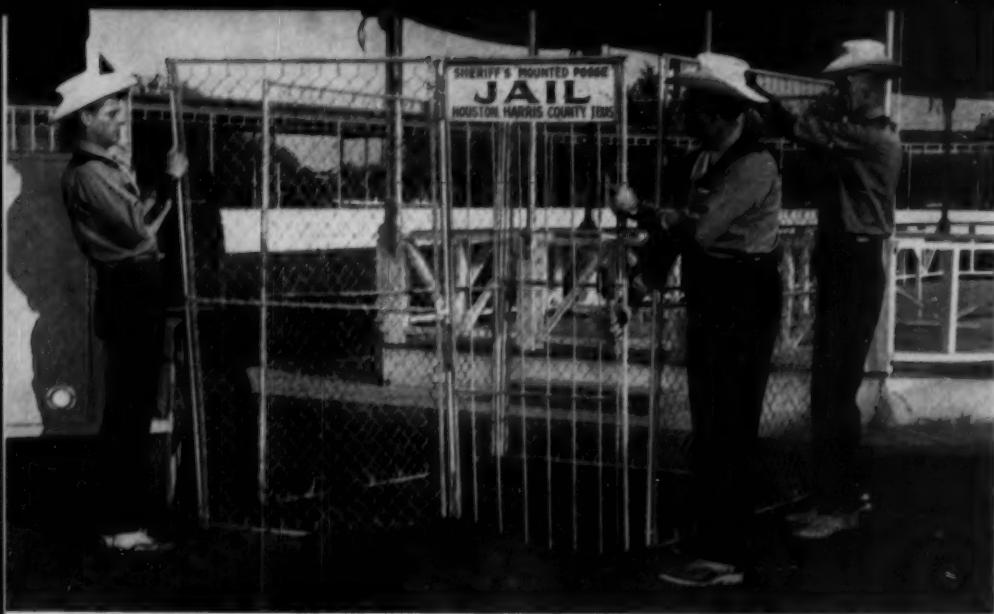
Backbone of the American Foundrymen's Society is the national committee structure of some 100 volunteer working groups. Made up of some of the top technical people in the field of castings, production and utilization, the committees are nevertheless constantly on the watch for "new blood" needed to provide new ideas . . . new approaches to old ideas . . . new backgrounds of experience . . . new enthusiasm.

AFS committees cover the field of foundry technology, and are constantly developing new data, recommended practices, and publications. Some of them are responsible for basic and applied research that is helping the castings industry advance from an art to a science.

Members of committees exchange valuable ideas, as they develop their projects, which are useful to the individuals and to their companies.

Committees are grouped largely into the following divisions: Brass & Bronze, Education, Gray Iron, Light Metals, Malleable Iron, Pattern, Sand, and Steel. In addition, there are a number of general interest committees covering such fields as: Safety, Hygiene, Air Pollution Control, Plaster Mold Casting, Costs, Plant & Plant Equipment, Industrial Engineering, Refractories, and others of broad interest to the entire industry.

If you want to join a national AFS committee, or merely want to learn more about committee activities, write to Hans J. Heine, Technical Director, American Foundrymen's Society, Golf & Wolf Roads, Des Plaines, Ill.



"Arrests" and precision riding by Sheriff's Mounted Posse will highlight Texas Chapter Night at this year's AFS Convention.

Offer Preprints of AFS Convention Papers

PREPRINTS of Convention papers available are listed on the facing page along with a form for requesting those in which the readers are interested. No other mailing of the Preprint Request Form will be made. Preprint requests should reach the AFS office by April 18 to guarantee requests will be filled.

Other Convention papers, which are not being preprinted but are being published in the April and May issues of *AMERICAN FOUNDRYMAN* are also listed on the following pages. Some papers not now available as preprints will be available at the door at Convention time.

A total of over 100 technical papers will be presented at about 50 sessions at the 1955 AFS Convention, Houston, May 23-27.

Most of the meetings will be held at the Rice Hotel and the Shamrock Hotel. Convention registration will be held at the Rice and ladies reg-

istration will be at the Shamrock.

Advance registration blanks appeared in the March issue of *AMERICAN FOUNDRYMAN*, pages 53-54. Application for hotel accommodations appeared in the February issue of *AMERICAN FOUNDRYMAN*, pages 51-52.

Many special activities are combined with the technical program to complete a well-rounded Convention. Highlights of the various meetings and special events and abstracts of the papers to be presented at the Convention follows.

Brass and Bronze meetings will be held Monday and Tuesday, May 23 and 24, and will consist of three sessions, two shop meetings and a Round Table Luncheon. Six papers will be presented. Research dealing with the "Improvement of Pressure-Tightness and Tensile Properties of Copper-Base Alloys," emanating from the Naval Research Labor-

atory and covering new information of the use of vacuum degassing will be one of the presentations. As in previous years the Round Table Luncheon promises to turn into a stimulating question and answer period (see page 66, this issue) during which problems of interest to all foundrymen will be discussed.

Malleable sessions will be held Monday and Tuesday, May 23 and 24, and will consist of three sessions, two shop courses and a Round Table Luncheon. Shop course meetings deal with pearlitic malleable iron and hot tearing, respectively. In addition, the influence of trace elements on annealability and the progress of the AFS sponsored research project on the "Effects of Melting Variables on Mechanical Properties" will be covered.

Light Metals meetings will touch on the application of insulated

continued on page 53

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One copy of each of the papers listed is available to AFS members gratis. Requests will be filled until supply is exhausted. All formal technical papers included in the program for the 1955 Convention whether or not contained in this list will be published, together with their discussions, in the annual *Transactions* next fall. Abstracts of papers start on page 54 of this issue of *American Foundryman*.

Your cooperation is requested on the following:

1. Please bring with you copies of preprints that you wish to discuss at the Convention. Free distribution of preprints listed below will not be made during Convention. However, preprints that become available between publication of this list and Convention can be obtained gratis on request at the AFS Publications Booth on the mezzanine of the Rice Hotel.

2. On the detachable postpaid card above, circle order number of each preprint desired, returning the card to the AFS office preferably not later than April 18. The card will be used as a Mailing Label for preprints you order. Type or print clearly. Be sure your name and mailing address are correct on the card.

BRASS AND BRONZE

3 "Short-Time Elevated Temperature Properties of Three Copper-Base Casting Alloys"—J. O. Edwards, Department of Mines and Technical Surveys, Ottawa, Ontario, Canada

4 "Improvement of Pressure Tightness and Tensile Properties of Gun Metal Bronze by Vacuum Degassing"—W. H. Johnson, H. F. Bishop, and W. S. Pellini, Naval Research Laboratory, Washington, D. C.

GRAY IRON

21 "Theory of Nodular Graphite Formation in Ductile Cast Iron"—P. H. Anderson, South Dakota School of Mines, Rapid City, S. D.

22 "Oxygen Content of Gray Cast Iron Increases With Time"—R. C. Williams and H. W. Lowrie, Jr., Battelle Memorial Inst., Columbus, O.

23 "Fluidization-Injection Process for Desulphurizing and Upgrading Cast Iron: A Progress Report"—G. P. Dahm, H. C. Barnes, and C. E. Bieniosek, Linde Air Products Co., Newark, N. J.

25 "Dissolved Gas in Liquid Cast Iron"—W. Y. Buchanan, John Lang & Sons, Ltd., Johnstone, Renfrewshire, Scotland

26 "Calcium Carbide Desulphurization by the Injection Process"—J. A. DeHuff, Air Reduction Co., Murray Hill, N. J. and Richard Schneidewind, University of Michigan, Ann Arbor, Mich.

27 "Increasing the Carbon Content of Cast Irons by Ladle Injection"—G. E. Spangler, Air Reduction Co., Murray Hill, N. J. and Richard Schneidewind, University of Michigan, Ann Arbor, Mich.

28 "New High Strength Cast Irons Produced by Injection Methods"—J. W. Estes, Air Reduction Co., Murray Hill, N. J. and Richard Schneidewind, University of Michigan, Ann Arbor, Mich.

30 "Machinability Testing — Relation Between Cutting Temperature and Tool Life for Gray Iron"—E. A. Loria, Crucible Steel Co., Pittsburgh, Pa. and D. R. Walker, Massachusetts Institute of Technology, Cambridge, Mass.

32 "Nickel Austenitic Ductile Irons"—F. G. Sefing, The International Nickel Co., Inc., New York

LIGHT METALS

41 "Castings in Airframe Design"—G. W. Papen, Lockheed Aircraft Corp., Burbank, Calif.

44 "Foundry Characteristics and Properties of the High Temperature Magnesium Sand Casting Alloy HZ32XA"—K. E. Nelson, The Dow Chemical Co., Midland, Mich.

47 "Application of Insulated Risers to Production of Aluminum Alloy Sand Castings"—W. A. Mader, Oberdorfer Foundries, Inc., Syracuse, N. Y.

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48 "Mechanical Properties of Cast Titanium-Silicon Alloys"—H. W. Antes and R. E. Edelman, Frankford Arsenal, Philadelphia

MALLEABLE IRON

62 "Embrittlement, Toughening, and Subcritical Thermal Treatment of Malleable Iron"—G. E. Kempka, University of Wisconsin, Madison, Wis.

63 "Effects of Trace Amounts of Tin, Lead and Antimony on Annealing of Blackheart Malleable Iron"—R. C. Shnay, Department of Mines and Technical Surveys, Ottawa, Ontario, Canada, and J. E. Wilson and J. E. Rehder, Canada Iron Foundries, Montreal, Canada

64 "Effects of Some Melting Variables on Properties of Malleable Iron"—G. E. Kempka and R. W. Heine, University of Wisconsin, Madison, Wis. (Progress Report on AFS-sponsored Research Project)

SAND

101 "It Is Not All Sand"—C. A. Sanders, American Colloid Co., Chicago, and Nathan Levinsohn, Minneapolis-Moline Co., Minneapolis, Minn.

102 "Use of Engineering Methods in Practical Sand Problems: Strength-Density Relationships"—V. E. Zang and G. J. Grott, Unitcast Corporation, Toledo, Ohio

105 "Fundamental Principles of the Agglomerating Processes"—Carl Ludwig, Bonnot Co., Canton, Ohio

107 "A Critical Analysis of the Cylindrical Standard Test Specimen for Foundry Sands"—Walter Goetz, George Fischer Limited, Schaffhausen, Switzerland

STEEL

122 "A Metallographic Study of Ruptures in Steel Castings"—J. B. Caine, Consultant, Wyoming, Ohio

123 "High Temperature Impact Properties of Cast Steel"—C. F. Christopher, Continental Foundry & Machine Co., East Chicago, Ind.

125 "Ladle Practice"—A. P. Guidi, Texas Electric Steel Casting Co., Houston, Texas

130 "Pressure Pouring and Graphite Permanent Molds Used in Production of Steel Car Wheels"—H. H. Hursen, Griffin Wheel Co., Chicago

HEAT TRANSFER

136 "Feeding Range in Shell Molds"—R. E. Morey, H. F. Bishop, and W. S. Pellini, Naval Research Laboratory, Washington, D. C.

INDUSTRIAL ENGINEERING

141 "Your Hidden Fixed Costs and Their Effect on Profit and Loss"—M. E. Annich, American Brake Shoe Co., Mahwah, N. J.

142 "Improving Foundry Paperwork"—M. E. Mundel, Marquette University, Milwaukee, Wis.

The following papers will not be available as separate preprints but will appear in the April and May issues of **AMERICAN FOUNDRYMAN**.

"Vapor Holes From Loose Sand Grains in Brass and Bronze Castings"—W. B. George and Floyd Keller, R. Lavin & Sons, Inc., Chicago. (April, pages 40-42)

"Bottom-Pour Ladle Practice"—A. W. Fastabend, Indiana Harbor Works, American Steel Foundries, East Chicago, Ill. (April, pages 43-45)

"Make Plaster Cores in Rubber-Lined Boxes"—R. F. Dalton, Hills-McCanna Co., Chicago. (April, pages 46-49)

"Rising of Ductile Cast Iron"—R. A. Flinn and W. A. Spindler, University of Michigan, and D. J. Reese, International Nickel Co., Bayonne, N. J. (April, pages 62-66)

"Casting Precision Patterns in Zircon Molds"—J. E. Stock and A. V. Schoville, John Deere Waterloo Tractor Works, Waterloo, Iowa. (April, pages 34-37)

"Metallurgical Controls for Duplexed Malleable"—L. E. Emery, Marion Malleable Iron Works Div., Chicago Ry. Equipment Co., Marion, Ind. (May)

"General Motors' Experimental Foundry"—L. J. Pedicini, Process Development Sec., General Motors Corp., Detroit. (May)

"Improving Casting Quality Through Nondestructive Testing"—F. H. Hohn, Scullin Steel Co., St. Louis. (May)

"Developments in the Light Castings Industry Including the New Die Pressing Process"—R. S. M. Jeffrey, Federated Foundries, Ltd., England. (May)

"What Design Engineers Look for in Castings"—T. Davidson, Bucyrus Erie Co., South Milwaukee, Wis.

"Stopping Blow-By in Core Boxes"—R. L. Olson, Dike-O-Seal, Inc., Chicago. (May)

continued from page 50

risers to aluminum castings and further information on titanium-silicon alloys. Sixteen papers will be presented at the five sessions and one Round Table Meeting, which will be held Monday, Tuesday and Wednesday, May 23, 24 and 25.

Sand will have eight sessions and two Shop Course meetings extending through the entire week. Wednesday evening, May 25, there will be a Sand Division Dinner meeting at which a film covering the use of "Carbon Dioxide for Baking Molds and Cores" will be presented for the first time in the United States. One of the co-inventors will also present a paper and discuss his European experiences. Sessions, which will include 15 papers, will deal with the progress of the AFS-sponsored research work, core room practice, test patterns for the evaluation of sand mixtures and other developments.

Safety, Hygiene and Air Pollution Control will have four papers presented, a demonstration of engineering methods for the control of noise sources, and a demonstration on radiant heat, at six sessions to be held Monday, Tuesday and Wednesday afternoons, May 23, 24 and 25. In anticipation of the forthcoming AFS publication **ENGINEERING MANUAL FOR THE CONTROL OF EXTERIOR AIR POLLUTION BY FOUNDRIES**, emphasis has been placed on papers dealing with the chapters that have been completed.

Gray Iron Shop Course sessions will be held Monday and Tuesday evening, May 23 and 24, and will focus on "Practical Inoculation of Cupola Melted Irons and Efficient Cupola Operation." A Round Table Luncheon Wednesday noon and one session Wednesday afternoon, May 25, three sessions Thursday, May 26, and one Friday, May 27, will include 14 papers. A series of three papers dealing with the results of extensive research into the advantages of injection with calcium carbide will be of interest to all gray iron foundrymen. A comprehensive review of the properties and application of nickel-austenitic ductile iron will be presented for the first time.

Steel sessions will be held Wednesday, Thursday and Friday, May 25, 26 and 27, and will include a discussion of factors contributing to the production of quality steel cast-

ings. Four meetings and a Round Table Luncheon will include 14 papers. New data on hot tearing and ruptures of steel castings will be presented and a recently developed procedure for making cast steel wheels in graphite molds will also be covered. A paper dealing with the use of steel castings in railroad operations will also be presented.

Pattern papers on "Gypsum Cement Molds for Casting Plastic Patterns" and "Sealing Metal Core Boxes Against Blow-by," will cover new developments, at one of the two sessions to be held Thursday, May 26. The other session will be devoted to a discussion of pattern equipment for high-pressure molding. A Round Table Luncheon will be held Wednesday noon, May 25.

Heat Transfer, in commemoration of Dr. H. A. Schwartz, who was chairman of the Heat Transfer Committee for many years, will present a "Dr. H. A. Schwartz Memorial Forum on the Application of Heat Transfer Principles to Foundry Practice." The application of chills and the risering of steel and nodular iron castings will be discussed. Meetings will be held on two successive afternoons, Wednesday and Thursday, May 25 and 26.

Education technical session will be held Tuesday morning, May 24, at which time "Workshop for Local Chapter Educational Committee Chairman" will be staged. A Round Table Luncheon will be held Tuesday noon. "In Plant Training" will be discussed at the luncheon.

Industrial Engineering will hold a technical session Tuesday morning, May 24, and a Round Table Luncheon Thursday noon, May 26. Three papers are to be presented, covering "Improving Foundry Paperwork," "Production Standards," and "Your Hidden Fixed Costs and Their Effect on Profit and Loss."

Refractories meetings will be held on Wednesday and Thursday afternoon, May 25 and 26. Subjects covered will include "Improving Refractory Cost in Malleable Melting" and "Forehearth Refractories for Soda Ash Desulphurizing."

Plaster Mold Casting session will be held Monday morning, May 23. "Influence of Vibration on Fluidity and Filling During Investment Casting of an Aluminum Alloy", will be

one of the three papers presented.

Plant and Plant Equipment session is scheduled for Wednesday afternoon, May 25.

Symposium on Non-Destructive Testing, sponsored in cooperation with the Society for Non-Destructive Testing, will be held Friday afternoon, May 27. Papers will describe techniques used by Texas Foundries, Inc., Eastman Kodak Co., Magnaflux Corp., Scullin Steel Co. and Canadian Naval Research Establishment. Papers will cover experimental stress analysis, radiographic and x-ray inspection, and the use of radioactive isotopes as an important aid to quality control in foundries.

Ladies Program consists of a trip on the Houston ship channel, a theater matinée and a luncheon and style show. The ladies will attend the Annual Banquet Wednesday evening, May 25, and the Texas Chapter Night Thursday, May 26.

President's Reception will be held Sunday evening, May 22.

AFS Alumni Dinner will be held Tuesday evening, May 24.

AFS Past Presidents' Breakfast will be held Wednesday morning, May 25.

Annual Business Meeting will be held Wednesday morning, May 25.

Charles Edgar Hoyt Memorial Lecture will be presented following the Annual Business Meeting Wednesday morning. F. J. Walls, International Nickel Co., Detroit, will present a paper entitled "Education and the Future Foundryman."

AFS Annual Banquet will be held Wednesday evening, May 25.

Plant Visits Monday afternoon, May 23, will include trips to Quality Electric Steels Castings, Inc., and Houston Pattern Works. Tuesday morning, May 24, there will be a trip to Hughes Tool Co., and in the afternoon trips to Cleco Div., Reed Roller Bit Co., and Wolf Pattern Works. Thursday morning, May 26, trips will include Oil Tool Div., Reed Roller Bit Co., and Federal Steel Products. In the afternoon visits will include Dee Brass Foundry and Texas Electric Steel Casting Co. Friday morning, May 27, Cameron Iron Works, Inc., will be opened for visitors.

Texas Chapter Night will be held Thursday, May 26, and will include a mounted drill by the Sheriff's Posse, then a barbecue dinner from

a chuck wagon. After dinner the sheriff has some "arrests" to make. Horses are available for guests to find their "saddle seat," and a program of professional entertainment will follow.

Three Air Tours of Mexico have been scheduled following the Convention. The nine-day tours will cost approximately \$245, and include visits to key cities, art and cultural centers, and historic sites, a tour of Mexico night clubs, a bull fight, and optional jungle and fishing trips. Tours are scheduled to leave Houston May 29 and 30. Details can be secured by writing E. R. Brown, Harvey Travel Bureau, 2005 West Gray Ave., Houston 19, or F. M. Wittlinger, Texas Electric Steel Casting Co., Houston. Other tours can be arranged with National Railways of Mexico through the San Antonio, Texas, office.

Convention Paper Abstracts

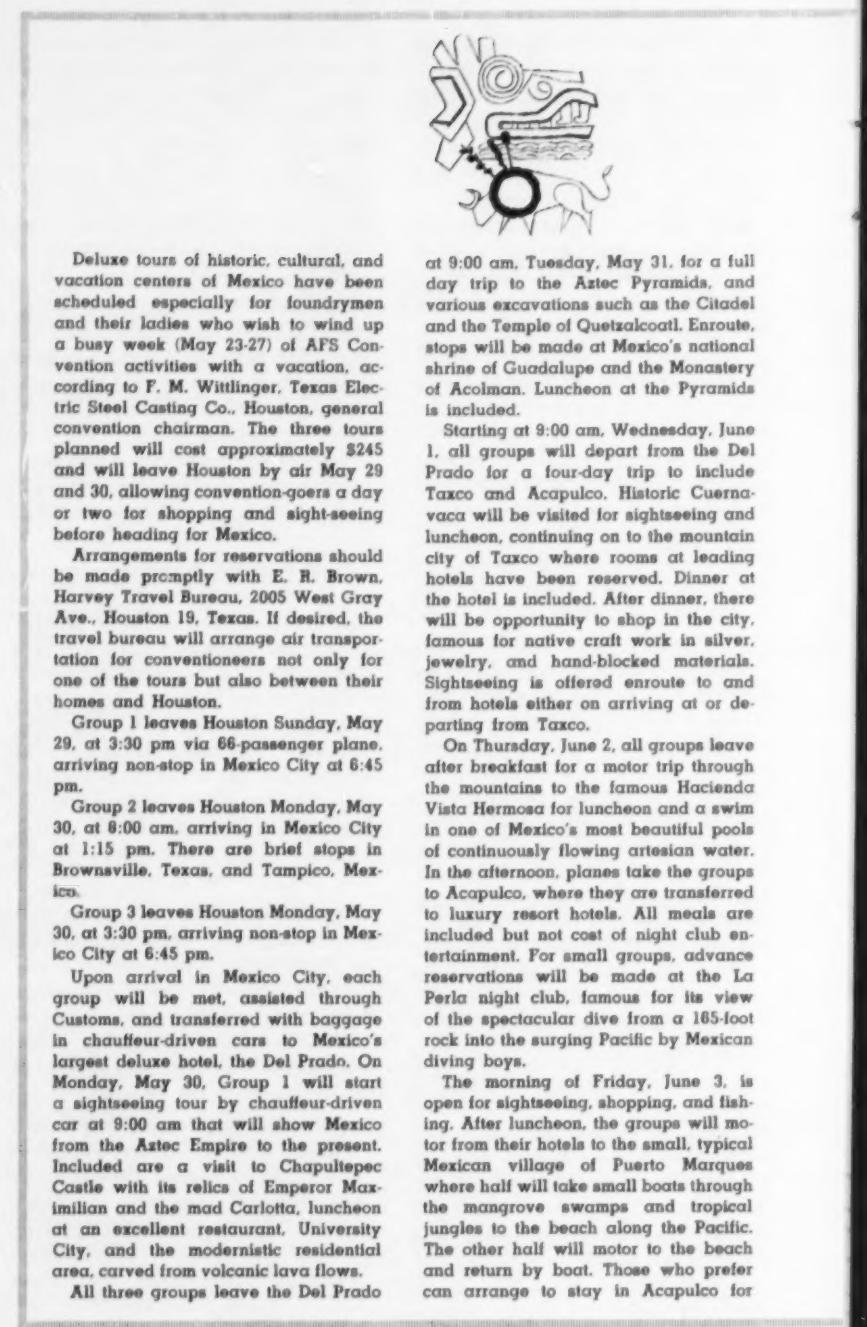
Abstracts of some of the 1955 AFS Convention papers to be presented in Houston, May 23-27, appear below, grouped by metal and foundry operation interest.

Brass and Bronze

55-1.. "Vapor Holes from Loose Sand Grains in Brass and Bronze Castings," W. B. George and Floyd Keller, R. Lavin & Sons, Inc. (pages 40-42, this issue).

55-2.. "Dimensional Tolerances and Surface Structure in Various Shell Cast Metals," Richard A. Flinn, Walter B. Pierce, and Floyd R. Smith, University of Michigan, and Paul F. Youngdahl, Mechanical Handling Systems Inc. Cobalt-base heat-resistant alloy HS 31, SAE 4140 steel, nodular iron, gray iron, and 85-5-5 brass were poured into step bar molds of resin bonded and synthetic sands. Better surface qualities were obtained in the lighter sections of the 1/16 to 2-in. test casting and with the cobalt base alloy and cast iron. Reaction of steel with the mold produced roughness in heavy sections and brass surfaces were rough from penetration. Varying resin content between 4 and 12 per cent had little effect upon surface quality.

Dimensional variations for those sections wholly in the cope or drag



Deluxe tours of historic, cultural, and vacation centers of Mexico have been scheduled especially for foundrymen and their ladies who wish to wind up a busy week (May 23-27) of AFS Convention activities with a vacation, according to F. M. Wittlinger, Texas Electric Steel Casting Co., Houston, general convention chairman. The three tours planned will cost approximately \$245 and will leave Houston by air May 29 and 30, allowing convention-goers a day or two for shopping and sight-seeing before heading for Mexico.

Arrangements for reservations should be made promptly with E. R. Brown, Harvey Travel Bureau, 2005 West Gray Ave., Houston 19, Texas. If desired, the travel bureau will arrange air transportation for conventioners not only for one of the tours but also between their homes and Houston.

Group 1 leaves Houston Sunday, May 29, at 3:30 pm via 66-passenger plane, arriving non-stop in Mexico City at 6:45 pm.

Group 2 leaves Houston Monday, May 30, at 8:00 am, arriving in Mexico City at 1:15 pm. There are brief stops in Brownsville, Texas, and Tampico, Mexico.

Group 3 leaves Houston Monday, May 30, at 3:30 pm, arriving non-stop in Mexico City at 6:45 pm.

Upon arrival in Mexico City, each group will be met, assisted through Customs, and transferred with baggage in chauffeur-driven cars to Mexico's largest deluxe hotel, the Del Prado. On Monday, May 30, Group 1 will start a sightseeing tour by chauffeur-driven car at 9:00 am that will show Mexico from the Aztec Empire to the present. Included are a visit to Chapultepec Castle with its relics of Emperor Maximilian and the mad Carlotta, luncheon at an excellent restaurant, University City, and the modernistic residential area, carved from volcanic lava flows.

All three groups leave the Del Prado

at 9:00 am, Tuesday, May 31, for a full day trip to the Aztec Pyramids, and various excavations such as the Citadel and the Temple of Quetzalcoatl. Enroute, stops will be made at Mexico's national shrine of Guadalupe and the Monastery of Acolman. Luncheon at the Pyramids is included.

Starting at 9:00 am, Wednesday, June 1, all groups will depart from the Del Prado for a four-day trip to include Taxco and Acapulco. Historic Cuernavaca will be visited for sightseeing and luncheon, continuing on to the mountain city of Taxco where rooms at leading hotels have been reserved. Dinner at the hotel is included. After dinner, there will be opportunity to shop in the city famous for native craft work in silver, jewelry, and hand-blocked materials. Sightseeing is offered enroute to and from hotels either on arriving at or departing from Taxco.

On Thursday, June 2, all groups leave after breakfast for a motor trip through the mountains to the famous Hacienda Vista Hermosa for luncheon and a swim in one of Mexico's most beautiful pools of continuously flowing artesian water. In the afternoon, planes take the groups to Acapulco, where they are transferred to luxury resort hotels. All meals are included but not cost of night club entertainment. For small groups, advance reservations will be made at the La Perla night club, famous for its view of the spectacular dive from a 165-foot rock into the surging Pacific by Mexican diving boys.

The morning of Friday, June 3, is open for sightseeing, shopping, and fishing. After luncheon, the groups will motor from their hotels to the small, typical Mexican village of Puerto Marques where half will take small boats through the mangrove swamps and tropical jungles to the beach along the Pacific. The other half will motor to the beach and return by boat. Those who prefer can arrange to stay in Acapulco for

were of the order of 0.002 — 0.004 in./in. whereas those of sections having a parting line were over twice this variation.

Microstructures showed alloys in either green sand or shell molds to be comparable. The $1\frac{1}{8}$ -in. section of gray iron shell cast did not contain massive carbide while the same section in green sand contained amounts excessive for good machinability.

A special dilatometer is described which was built to measure dimensional changes of shells on heating and cooling.

55-5.. "Feeding of Castings," Thornton C. Bunch and George E. Dalbey, Mare Island Naval Shipyard. Low density areas tend to occur adjacent to risers on simple plate castings. Insulation of risers reduces this defect. The experimental series presented is an ex-

Arrange Three Mexican Post-Convention Tours

boating and fishing. Fishing parties of four and six reserve boats and equipment (\$8-10 per person) for sailfish or blue marlin fishing.

Saturday morning, June 4, is open for individual plans in which travel bureau representatives will be glad to assist. In the late afternoon and evening, planes return the groups to Mexico City, with transfer from airport to hotel provided. Starting at 9:30 pm, cars take group members on a night club tour with stops at three different types of clubs, and a midnight dinner at one of the city's best.

On Sunday, June 5, after an opportunity for church attendance, automobile take the foundrymen and their ladies on sightseeing tours which include the Tiffany Glass Curtain in the Palace of Fine Arts, and the Floating Gardens of Xochimilco with a ride through the canals on flower-decorated gondolas followed by native musicians. Luncheon is provided in an excellent restaurant. Motor transportation is provided to and from the bull ring where good seats are included in the arrangements. The evening is left open.

Group 1 and Group 2 will leave Mexico City on Monday, June 6. Group 1 leaves at 11:00 am, arriving non-stop in Houston at 2:00 pm. Group 2 leaves at 3:30 pm, arriving in Houston at 8:20 pm, with stops in Tampico and Brownsville. Arrangements for those in Group 1 who wish to take the later flight, or in Group 2 who wish to return with Group 1, can be made. Those in Group 2 will have had one less night in Mexico City and will be entitled to a reduction in tour cost or may stay on by arrangement. Group 3, plus those in Group 2 staying on, will take the same sightseeing trip with luncheon offered Group 1 on May 30. Group 3 will leave Mexico City at 11:00 am on Tuesday, June 7, arriving non-stop in Houston at 2:00 pm.

Cost of the tour (\$245) includes: round trip air fare from Houston to Mexico

City to Acapulco to Mexico City to Houston . . . deluxe and first class hotels in Mexico City, Taxco, and Acapulco (two persons per room; single rooms, if available, are extra) . . . all transfers between airports and hotels and all transportation as outlined in private automobiles limited to four passengers and driven by competent, English-speaking driver-guides . . . all admissions on sightseeing trips . . . all tips involving baggage transfers, sightseeing, meals when included in arrangements, and involving hotel service other than in Mexico City or where services are of a personal nature . . . all meals outside Mexico City, all meals on planes, meals in Mexico City specifically mentioned in sightseeing arrangements . . . Mexican tourist cards . . . U. S. transportation taxes and Mexican hotel and transportation taxes. Not included are meals in Mexico City except as specifically mentioned . . . fishing trip in Acapulco . . . beverages not served with meals as provided . . . valet or other personal services.

Reservations can be made by writing to E. R. Brown, Harvey Travel Bureau, P. O. Box 13376, Houston 19, Texas, or F. M. Wittlinger, Texas Electric Steel Casting Co., P. O. Box 3012, Houston, Texas. Requests for reservation should be accompanied by a deposit of \$50.00 which is refundable in its entirety if cancellation is made prior to two weeks before departure, at which time full payment will be required to protect reservations on air lines and at hotels.

Those desiring to travel by air to Houston for the Convention, can arrange to include the complete trip to Houston, Mexico City, Acapulco, and return via Houston or some other route, on air line tickets issued by Harvey Travel Bureau. Reservations will be made by the bureau with convention-goers getting the benefit of any round trip discounts possible.

amination of the feeding characteristic of non-ferrous metal risers.

Gray Iron

55-21 . . . "Theory of Nodular Graphite Formation in Ductile Cast Iron," Paul H. Anderson, South Dakota School of Mines. A hypothesis is presented which takes into account the effect of surface energies involved in the formation of graphite nodules from carbon rejected from the iron matrix. It is proposed

that carbon precipitated from the matrix because of decreasing carbon solubility exists first as finely divided amorphous particles that become agglomerated into nodular masses which subsequently crystallize to give the characteristic radiating structure observed in nodular graphite. Nodular graphite is used to describe spherulitic masses of graphite found in castings that are cooled directly from the melt with-

out subsequent heat treatment. Ductile cast iron is that iron containing nodular graphite regardless of the particular structure of the non-graphitic matrix. The author reviews data on graphite crystallography and of some of the hypothesis explaining the mechanism of nodule formation.

55-22 . . . "Oxygen Content of Gray Cast Iron Increases with Time," Robert C. Williams and Harold W. Lownie, Jr., Battelle Memorial Institute. Samples of three flake-type graphite cast irons and a nodular iron were analyzed by vacuum-fusion methods at intervals up to one year from the time each was cast. Oxygen content of gray cast iron was found to increase with time. The amount and rate of absorption is dependent upon the structure of graphite flakes connected to the surface of the iron. Nodular iron absorbed very little oxygen.

55-23 . . . "Fluidization-Injection Procedures for Desulphurizing and Upgrading Cast Iron: A Progress Report," G. P. Dahm, H. C. Barnes, and C. E. Bieniosek, Linde Air Products Co., Div. of Union Carbide and Carbon Corp. Authors describe the principle, equipment, operation, and results of injecting finely powdered calcium carbide entrained in a stream of inert carrier gas and blown beneath the molten metal surface for the purpose of desulphurizing cast iron.

Upgrading or improving the physical properties of cast iron by transforming the shape of the free graphite by means of the injection process involves materials other than calcium carbide and requires an additional set of equipment. This is described and discussed thoroughly.

55-25 . . . "Dissolved Gases in Liquid Cast Iron," William Y. Buchanan, John Lang & Sons, Ltd., Johnstone, Renfrewshire, Scotland. The author demonstrates that many gas hole defects in cast iron can be caused by dissolved gases coming out of solution during metal solidification. He describes the method of collecting gas for analysis and rate of evolution. These tests may be correlated with atmospheric variations and the effect of various ladle add-continued on page 96

Improving Investment Casting Quality

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Level of stress-rupture properties obtained for GMR-235 alloy was raised and spread in results was decreased by gating investment cast test bars in accordance with practices determined by study of fluid flow characteristics in transparent plastic mold models. An economical method was developed for reproducing irregular casting shapes in cast transparent plastic mold models. The method has been extended to study gating systems for investment cast multiple-gated turbine buckets.

■ Development of new cast alloy compositions which utilize separately cast test bars for evaluation of composition and processing variables is dependent upon production of sound cast test bars. This problem was encountered at the General Motors Research Laboratories in the development of a cast super alloy for application in jet engine components. The nominal composition of this alloy, GMR-235 alloy, is shown in the table. Initial investigations showed this alloy to possess superior high temperature properties as measured by stress-rupture tests. Such tests consist of heating a test bar to some predetermined elevated temperature, loading it to a known stress, and measuring the time until rupture occurs. That time is known as stress-rupture life. Hot ductility is measured by the amount of elongation the bar undergoes during the test.

Since cast turbine buckets, (Fig. 1) are produced in investment molds, it is often necessary and desirable to produce cast test bars by the same method.

During the development of GMR-235 alloy it was found that the spread in test values obtained from bars supposedly made under the same conditions was greater than the effect due to composition variation. Examination of cast test bars showed a wide variation in soundness. It therefore became necessary to develop a method for producing sound investment cast test bars.

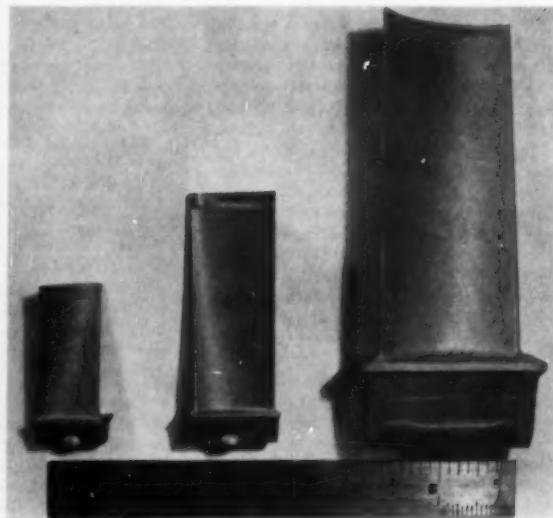


Fig. 1 . . Typical investment cast turbine buckets.

Nominal Composition of Cast GMR-235 Alloy

Element	%	Element	%
Carbon	0.15	Iron	10.0
Manganese	<0.10	Aluminum	3.0
Silicon	<0.60	Titanium	2.0
Chromium	15.5	Boron	0.075
Molybdenum	5.25	Nickel	Balance

Study of fluid flow characteristics in the test bar mold was first undertaken by examination of high speed motion pictures which recorded the flow of mercury in a plaster mold which was sectioned to expose the mold cavity and was faced with glass. These initial experiments showed the flow conditions to be highly

undesirable. However, information gained by this means of study was limited since only the surface of the fluid could be viewed and the mold cavity cross-sections were distorted by sectioning.

Results of AFS sponsored investigations at Battelle Memorial Institute on principles of gating demonstrated the benefits to be gained by fluid flow studies with transparent mold models. The investigation had been so successful that it was decided to apply the method to study of gating systems for investment molds.

For casting turbine buckets and test bars of GM-235 alloy, preheated investment molds were placed on top of the melting furnace with the downspurce directly over the crucible. Figure 2 shows an investment mold in position on top of an induction melting furnace. After clamping the mold securely in position, the entire mold-furnace assembly was inverted and the molten metal flowed by gravity into the mold. The pouring rate was governed somewhat by the speed with which the mold-furnace assembly was rolled over. This casting arrangement was used as a basis for the transparent mold studies.

Test Bar Development. A test bar development program was initiated by fabrication of transparent plastic mold model. Components of the gating system were made detachable so various gating arrangements could be examined.

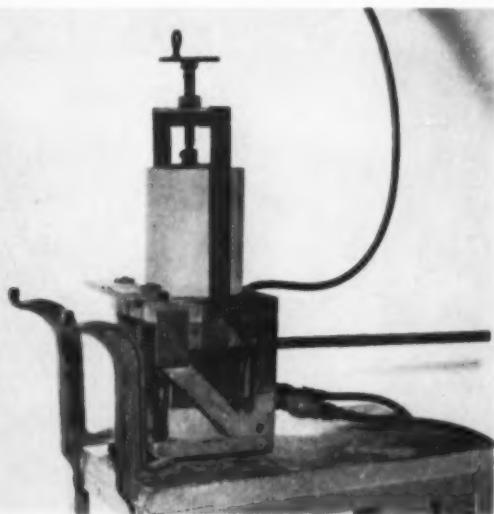


Fig. 2 . . Investment mold clamped on melting furnace.

The furnace crucible was also simulated in transparent plastic. Colored water was used to represent the molten metal. High speed motion pictures were taken at 1000 frames per second to aid in study of fluid flow in the mold model.

First examination showed flow conditions in the mold model to be very poor. A series of fluid flow experiments were made to develop a better gating arrangement. As a result of this investigation, soundness of investment cast test bars was greatly improved. The spread of stress-rupture test data was reduced and test results were obtained at considerably higher levels.

Typical spread of stress-rupture test results obtained with bars from the formerly used type A mold is shown in Fig. 3. Five stress-rupture tests were conducted at

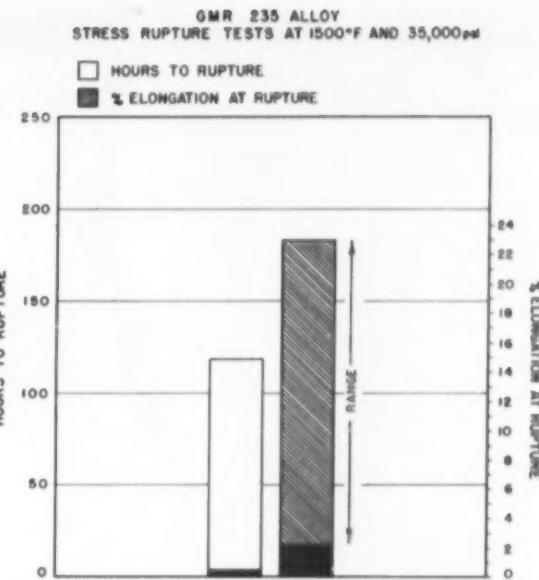


Fig. 3 . . Typical spread of stress rupture results obtained with test bars from previously used type A molds.

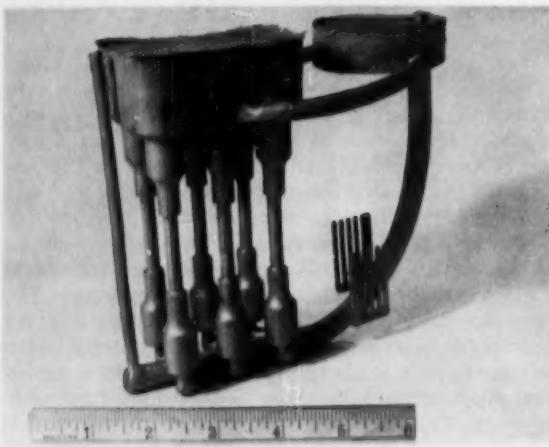
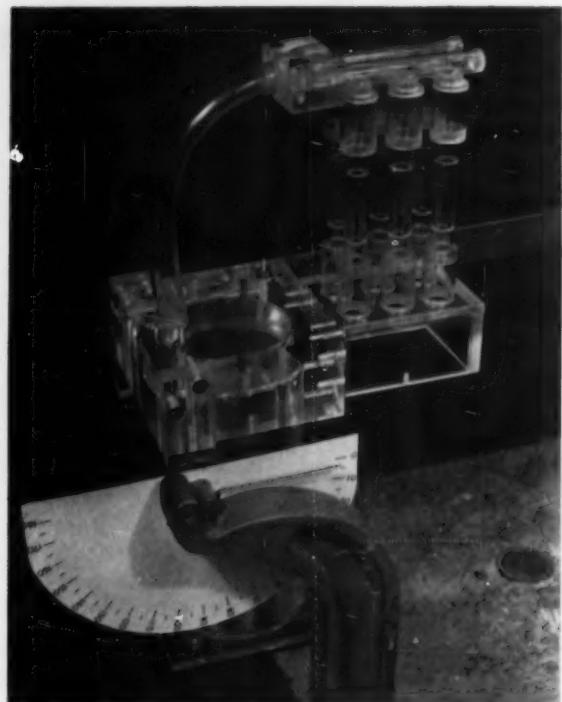
1500 F and 35,000 psi with bars from the same mold. Rupture life varied from 3.5 to 118 hours. Hot ductility was determined to be from 2.2 to 22.8 per cent elongation at rupture.

Figure 4 shows an investment casting from type A mold. It consisted of pouring cup and curved downspurce with a divided runner. Three $\frac{1}{4}$ -in. diameter stress-rupture test bars were bottom gated from each side of the runner. A large riser was common to all six bars. Clusters of bend test pins for determination of room temperature ductility were located at the ends of the runner.

The type A mold was simulated in plastic as shown in Fig. 5. Test bar cavities, ingates, runner, and downspurce were fabricated of various diameter tubing. The riser was made of $\frac{1}{4}$ -in. thick sheet plastic and the pouring cup was machined from a block of solid lucite. All joints were made tight slip fits for easy assembly and disassembly. A large plastic tube was provided to represent the crucible. The mold and crucible models were held together properly with tie rods. Furnace trunnions were fixed in position and the assembly mounted for examination on the melting stand.

Study of this type A mold model showed much turbulence was generated at the ingates when rapid roll-over speeds were used. The roll-over speed generally practiced for the type A mold was determined to be too fast. Air was trapped at the division of the runner and subsequently found its way into the test bar cavities. Slow roll-over rates reduced the turbulent condition at the ingates but did not eliminate trapped air in the runner.

Various gating arrangements were examined with transparent mold models for attainment of satisfactory fluid flow characteristics. During examination of flow characteristics in the models the following factors of mold design and casting technique were evaluated: (1) Curvature of the downspurce; (2) Geometry of the runner system; (3) Restrictions in gating arrangements;



(4) Gating of risers; (5) Venting of mold cavities; and (6) Speed of rollover.

After observation of nine gating systems, one was developed which bottom fed the castings without turbulence or entrapment of air and top fed the riser for feeding of the castings during solidification. This gating system was utilized in the type J mold. A casting from a type J mold is shown in Fig. 6.

An enlarged pouring cup was provided. The curved downspurte joined a 45° cross-runner and a vent was placed at the end of the center runner. Side runners were of reduced cross-section and ingates were located at the ends of the side runners. The large riser, common to all six test bar castings, was fed at both sides from the pouring cup.

Black dye was placed in the runners from pouring cup to riser. The amount of liquid which entered the

riser from the pouring cup and the time it occurred was determined by observing the flow of black liquid into the riser. This technique provided a unique means of studying the distribution of hot metal provided to feed the casting during solidification.

Study of the type J mold model showed that the entry of liquid into the riser from the pouring cup had to be critically located to effect uniform distribution to all six test bars. The optimum location of the entry to the riser was found to be dependent upon the speed of the rollover.

Soundness of test bars from type J molds was much improved. Stress-rupture properties were obtained at somewhat higher levels and the spread in test results was greatly reduced. However, shrinkage in the large riser was prone to extend down into the two test bars at the center of the bar arrangement.

Fig. 4 (far left) . . Investment casting from type A test bar mold.

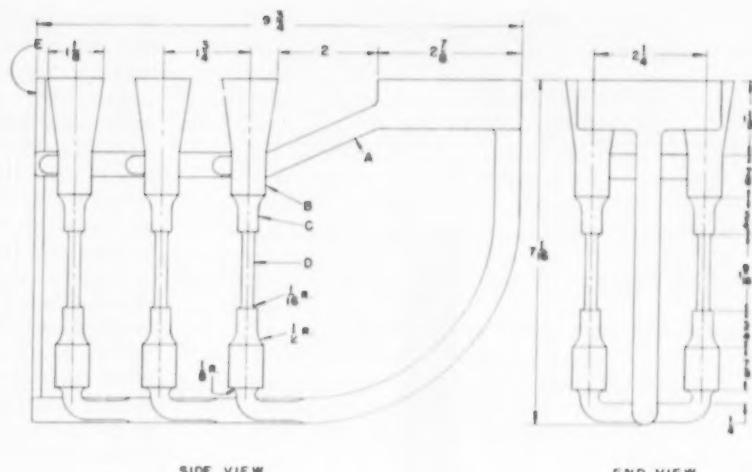
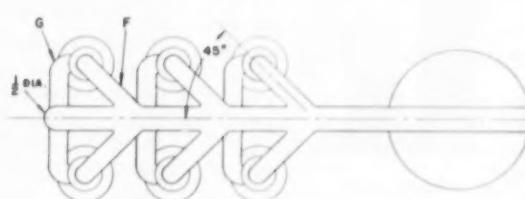


Fig. 5 (near left) . . Plastic mold model of type A test bar mold.

Fig. 6 (below, far left) . . Investment casting from a type J test bar mold.

Fig. 7 (below, near left) . . Type K-2 test bar mold was used here.



NOTE	DIMENSION
A	1/2 DIA
B	1/4 DIA
C	1/4 DIA
D	1/4 DIA
E	1/4 DIA
F	1/4 DIA
G	1/4 DIA

The type K-2 test bar mold evolved directly from the type J mold after two further gating variations were examined. Figure 7 shows a casting from a type K-2 mold. Dimensions of the test bars and gating system are shown in Fig. 8. The large common riser was abandoned and each test bar provided with an individual riser. All risers were fed with hot metal through a center runner extending from the pouring cup. Entry of metal from the pouring cup to the risers was located on the side of the bars farthest from the downspur. This arrangement allowed the test bar castings to bottom feed until metal rose to the bottom of the risers. A new hot metal stream was then admitted to the riser. The bottom runner system, proven satisfactory for the type J mold, was also used for the type K-2 mold.

Visual soundness of test bars cast in type K-2 molds was comparable to that of bars from type J molds. However, stress-rupture test results obtained with test bars from type K-2 molds were at still higher levels than those obtained with bars from type J molds. Figure 9 shows results of a controlled experiment to compare stress-rupture test results obtained with bars from the formerly used type A mold and from the K-2 mold developed during this investigation. Metal for both molds was from the same master heat of GMR-235 alloy. Stress-rupture tests were conducted at 1500 F and 35,000 psi load. Rupture life of tests representing the type A mold was from 40 to 168 hours; over 400 per cent spread in values and a 93 hour average duration. Elongation at rupture was 4.6 to 4.7 per cent. Tests with bars from the type K-2 mold show rupture life of 257 to 289 hours. Average rupture life was 275 hours and the spread of these results was only 12.5 per cent.

Hot ductility was increased to higher values of 6.2 to 10.9 per cent elongation at rupture.

Development of an investment cast test bar of suitable soundness allowed elimination of the previously experienced low test results and attainment of high temperature properties more truly representative of those inherent in the alloy.

This significant increase in high temperature properties and attendant reduction of spread in stress-rupture test results provided a basis for continued alloy research with conviction that alloy properties could be evaluated instead of relative soundness of test bars.

Cast Plastic Mold Models. The successful investigation of fluid flow in transparent models of test bar molds prompted attempts to apply that method to study of gating arrangements for other investment castings. Fabricating methods used to make plastic models for study of test bar gating systems were not suitable for producing mold models for study of gating of irregular shapes such as turbine buckets. A technique was developed for casting the irregular shapes into transparent plastic, thus circumventing the problem of reproducing difficult to machine cavities in solid plastic.

The technique developed consisted essentially of the following steps: Patterns were produced in low melting alloy of the parts required for the mold model. The patterns were assembled within a flask of glass after suitable surface finish was attained by polishing. The glass surfaces were coated with a release agent and a liquid cold pouring thermosetting polyester resin was cast around the metal patterns. After the liquid resin had cured to solid plastic, the plastic was heated until the metal patterns melted and drained from the plastic.

GMR 235 ALLOY
MASTER HEAT MCM-2967
STRESS RUPURE TESTS AT 1500°F AND 35,000psi

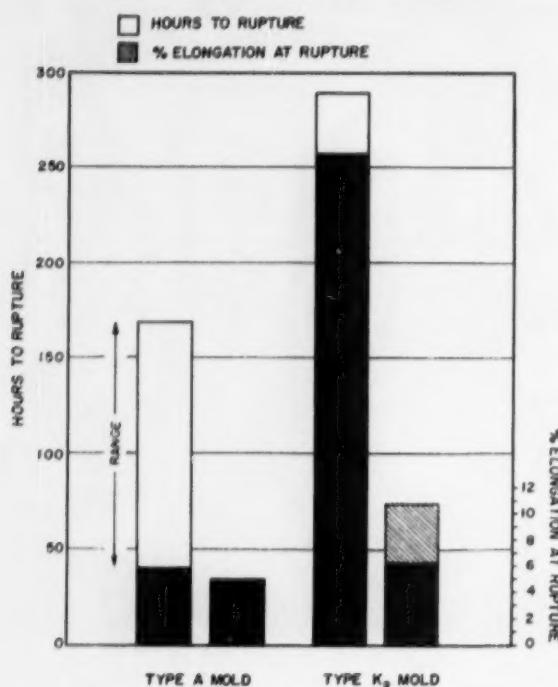


Fig. 9 . . Stress rupture test results show increase in properties due to improved gating in type K-2 mold.

Metal residues in the resultant cavities were leached clean with acids. A detailed outline of procedures for use of liquid cold pouring thermosetting resin is included in the appendix to this paper.

This technique of producing transparent plastic models of investment molds affords a means of examining gating systems for irregularly shaped and multiple-gated castings. An entire mold arrangement may

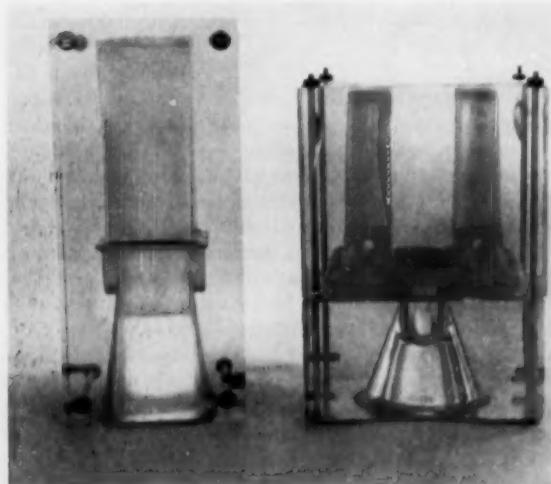


Fig. 10 . . Two cast plastic mold models constructed for study of entire gating systems.

be cast into plastic or the casting cavities may be cast in liquid resin and suitable ingates, runners, downsprues, and pouring cups fabricated from plastic sheet and tubing.

Most investment molds are small and entire mold arrangements may be studied simultaneously. Examples of cast plastic mold models for study of entire gating arrangements for typical turbine bucket castings are shown in Fig. 10. Both molds were cast in two sections and held together with tie rods.

Figure 11 shows a composite plastic model for study of individual gating components. Sections of the mold model shown are six turbine bucket cavities (three each in two plastic castings), two runner systems, a downspur, and a pouring cup. The pouring cup was machined with various liquid passages for use with other mold models. Any portion of such a mold model may be replaced with one of revised design since all components are easily detachable.

**Use of Liquid Cold-Pouring Thermosetting Resin
For Making Transparent Plastic Mold Models**

Metal patterns of mold components were made of a low melting alloy of the following composition: 50 per cent bismuth, 26.7 per cent lead, 13.3 per cent tin, 10 per cent cadmium. Melting point of the alloy is 158 F. Patterns were produced by heating the alloy to 190 F and casting into steel injection molds used for making wax patterns, investment molds, and plaster molds.

If patterns desired contained no thin sections, molds were used at room temperature. Molds were preheated to 170 F to enable satisfactory filling of thin edges on turbine bucket patterns. Slight agitation of the mold immediately after pouring avoided entrapment of air in the pattern molds. As soon as feasible after pouring, molds were quenched in water or in carbon tetrachloride cooled with dry ice to obtain pattern surfaces free of shrinkage. Proper feeding of metal patterns during solidification was assured by immersing only the bottoms of the molds.

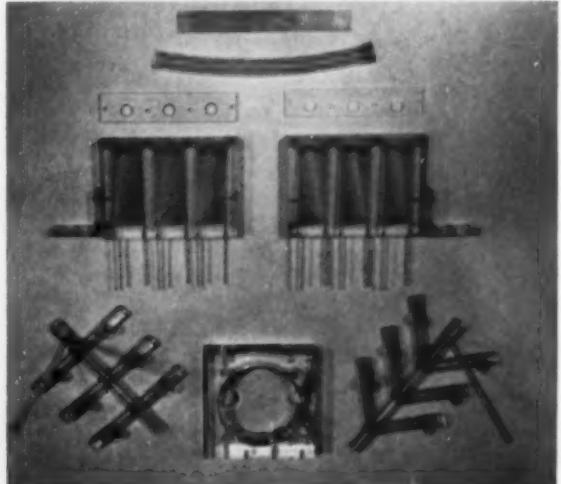


Fig. 11 . . Plastic mold model parts used in study of individual gating components.

Transparency of mold cavities was determined to be dependent upon the surface finish of metal patterns. Surfaces of metal patterns were not satisfactory for use as removed from pattern molds. Hand polishing was performed with No. 1, 1/0, 2/0, 3/0, and 4/0 emery papers, respectively, if required, followed by application of a rubbing compound. A final high luster was attained with a liquid polish. Ease of polishing external pattern surfaces afforded a great advantage over the difficulties involved with polishing internal surfaces of irregular shaped cavities. Thin turbine buckets and entire gating systems cast into plastic present almost unsurmountable obstacles to polishing all internal surfaces.

Polished metal patterns and pattern assemblies were fastened to a metal plate with screws or wax. A thin sheet of aluminum foil was placed between patterns and the plate. A flask of glass was built around the patterns. Interior surfaces of the glass were coated with a silicone parting agent.

Liquid plastic, a polyester resin, was mixed with the required amounts of hardener and promoter and was immediately cast into the flask. A sufficient length of time was then allowed for the cast plastic to cure to a

solid. Castings of up to 76½ cu in. volume were allowed to cure overnight at room temperature. Larger castings of 140 cu in. volume were refrigerated for up to five days immediately after casting and then allowed to warm to room temperature for an additional day. Curing reactions are exothermic and large castings, if not refrigerated, fractured due to overheating while curing. Peak temperature of curing was also minimized by maintaining amounts of hardener and promoter additives at lowest levels. Promoter may be eliminated entirely when making large castings of some polyester type resins.

The glass flask was separated from the cured plastic and the plastic removed from the plate. The plastic was then heated slowly to 185 F and held at that temperature until pattern metal had drained from the cavities. Fifty per cent nitric acid in water was used to leach remaining metal films from the cavities and 50 per cent hydrochloric acid in water subsequently dissolved precipitated salts.

Damaged or rough exterior mold surfaces were polished to desired transparency with various emery papers and rubbing compounds as previously described for preparation of metal patterns.

Calendar of Future Meetings and Exhibits

April

7-8. . Malleable Founders' Society
Edgewater Beach Hotel, Chicago.
Market Development Conference.

15. . Foundry Equipment Manufacturers Association
Shearton-Carlton Hotel, Washington,
D. C. Spring Meeting.

18-20. . Third National Air Pollution Symposium
Huntington-Sheraton Hotel, Pasadena, Cal. Sponsored by Stanford Research Institute.

18-20. . American Institute of Mining & Metallurgical Engineers
Bellevue-Stratford Hotel, Philadelphia. National Open Hearth Conference.

27-29. . Society for Experimental Stress Analysis
Hotel Statler, Los Angeles. Spring Meeting.

May

6. . American Association of Spectrographers
Chicago. Sixth Annual Conference.

10-12. . Metal Powder Association
Bellevue-Stratford Hotel, Philadelphia. Metal Powder Show and 11th Annual Meeting.

16-18. . Industrial Heating Equipment Association
The Homestead, Hot Springs, Va. Spring Meeting.

20-21. . Non-Ferrous Founders' Society
Congress Hotel, Chicago. Twelfth Annual Meeting.

22-26. . Air Pollution Control Association
Detroit. Forty-eighth Annual Meeting.

23-25. . American Management Association
Roosevelt Hotel, New York. General Management Conference.

23-27. . American Foundrymen's Society
Houston, Texas. 59th Annual Convention. Non-Exhibit.

June

8-10. . American Welding Society
Municipal Auditorium, Kansas City. Third Annual Welding Show.

15-17. . American Society of Training Directors
Ambassador Hotel, Los Angeles. Annual Convention.

16-17. . American Foundrymen's Society
Morrison Hotel, Chicago. Chapter Officers' Conference.

16-18. . Malleable Founders' Society
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

20-26. . International Foundry Congress
London, England. Host: The Institute of British Foundrymen.

26-28. . Alloy Casting Institute
The Homestead, Hot Springs, Va. Annual Meeting.

26-July 1. . American Society for Testing Materials
Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. Annual Meeting.

September

12-16. . Instrument Society of America
Shrine Exposition Hall, Los Angeles. 10th Annual Conference and Exhibit.

29-30. . Missouri Valley Regional Conference
Missouri School of Mines, Rolla.

October

6-7. . National Foundry Association
Edgewater Beach Hotel, Chicago. Fifty-seventh Annual Meeting.

13-15. . Foundry Equipment Manufacturers Association
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

16-18. . Conveyor Equipment Manufacturers Association
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

17-21. . American Society for Metals
Convention Hall, Philadelphia. National Exposition and Congress.

19-21. . Gray Iron Founders' Society
Hotel Schroeder, Milwaukee. Twenty-seventh Annual Meeting.

24-25. . Steel Founders' Society of America
The Greenbrier, White Sulphur Springs, West Virginia. Fall Meeting.

November

1-3. . Grinding Wheel Institute and Abrasive Grain Association
Statler Hotel, Buffalo. Fall Meeting.

16-18. . Steel Founders' Society of America
Hotel Carter, Cleveland. 10th Annual Technical and Operating Conference.

18-19. . Niagara Frontier Regional Foundry Conference
Syracuse, N. Y. Sponsored by the Central New York, Ontario, Northwestern Pennsylvania, Western New York, Rochester, and Eastern New York Chapters of AFS.



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Riserding Ductile Cast Iron

How to calculate risering that will adequately prevent either centerline or riser-neck shrinkage in castings of ductile iron. Methods similar to those described have been applied to steel and can be used for other feeding alloys. Written discussion of this paper, Convention Preprint No. 55-31, should be sent to American Foundrymen's Society, Gulf & Wolf Roads, Des Plaines, Ill. This paper is one of 16 to be presented at the Gray Iron sessions of the AFS Convention in Houston, May 23-27, 1955.

To obtain a sound ductile iron casting, two principal factors must be considered, riser size and riser placement. Riser size can be calculated from Fig. 1, which provides both adequate feed metal and a cooling rate in the riser which is sufficiently slower than that of the casting. Riser placement depends on the effective feeding distance of a riser in a particular casting. The following formulas indicate feeding distance in simple plates and bars; the data may be projected for more complex shapes:

For plates, effective feeding distance = $4.5t$, where t is the thickness of the plate (applies to $1/4$ to 2-in. sections).

For bars, effective feeding distance = $6\sqrt{t}$, where t is the thickness of the bar (applies to 2 to 4-in.

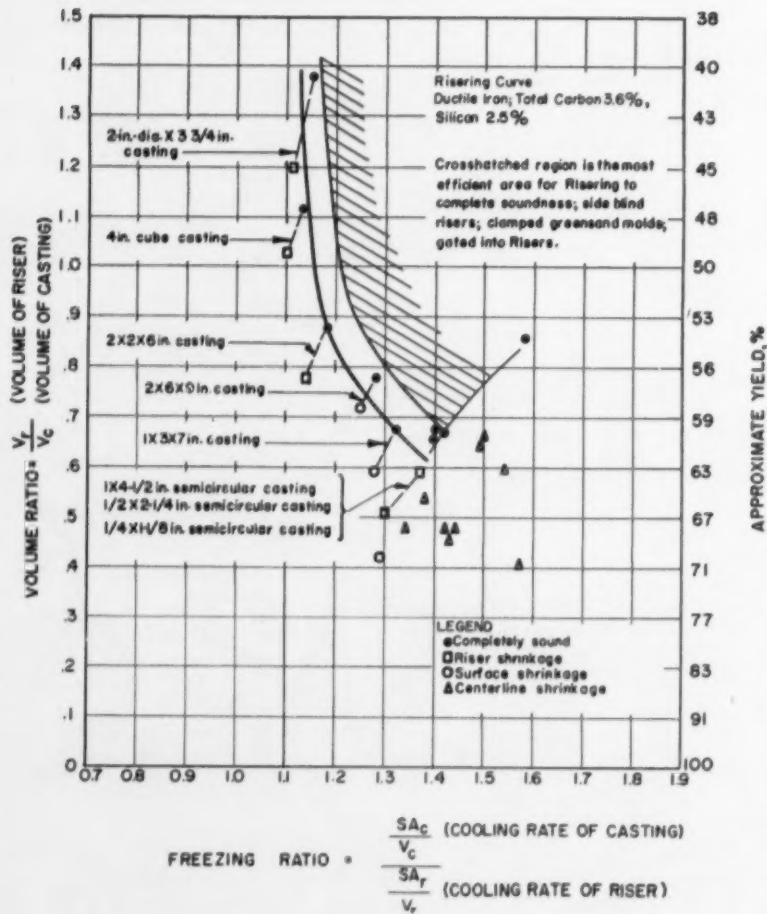


Fig. 1 . . Curve for calculating side blind risers for ductile iron.

Fig. 2a. Radiograph of test casting shows riser neck shrinkage extending into the casting caused by a riser that is too small.

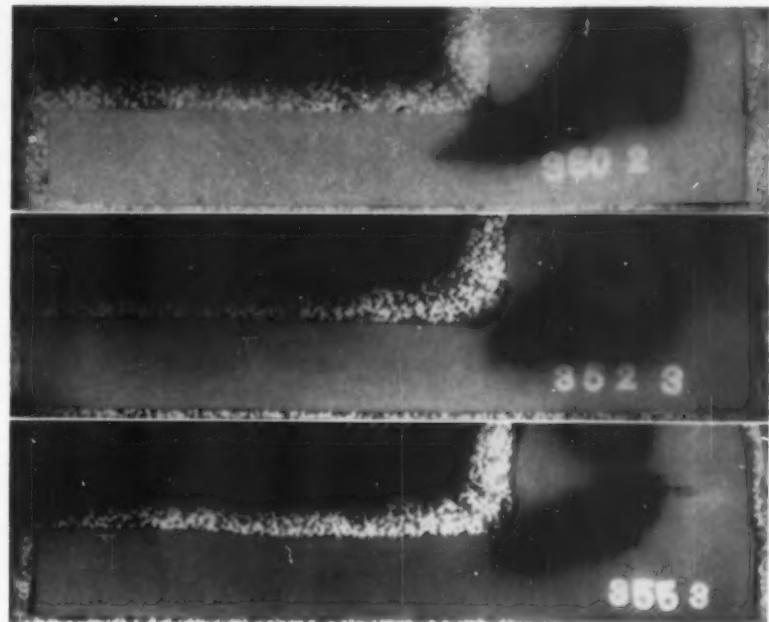


Fig. 2b. Centerline shrinkage (distinct in radiograph) beyond effective feeding distance.

Fig. 2c. Surface shrinkage can be caused by inadequate riser size or by exceeding effective feeding distance.

Table 1. Metal Analysis (per cent)

Heat No.	TC	Si	Mn	P
253	3.50	2.48	.22	.038
254	3.57	2.69	.31	.030
256	3.44	2.38	.24	.034
338	3.54	2.66	.34	.013
345	3.60	2.66	.31	.013
348	3.47	2.62	.30	.042
352	3.62	2.58	.19	.060
355	3.60	2.59	.18	.027
357	3.57	2.41	.17	.022
360	3.56	2.38	.29	.027
363	3.58	2.69	.23	.029
364	3.72	2.70	.22	.024
422	3.64	2.72	.20	.022

Table 2. Test Molding Sand

Mixture		Green Properties	
200 lb	Michigan City Sand	Moisture	2.9-3.3%
	AFS Fineness No. 55	Permeability	130-150
9 lb	Western Bentonite	Compression	7-10 psi
10 lb	Seacoal	Deformation	0.017-0.021 in./in.
6 lb	Water		

sections). A bar is considered as such when the width is less than $3t$. These data corroborate those of Pellini for cast steel.

When a risering system is improperly designed, shrinkage may be encountered in the casting from one or both of the two distinct causes illustrated in Fig. 2a and 2b, and previously described by Caine¹ and Bishop and Pellini² for the case of steel:

Riser-neck shrinkage (Fig. 2a) extending into the casting is caused by a riser that is too small. A riser of the proper (larger) size freezes much later than the casting and delivers an adequate supply of liquid iron to fill the shrinkage voids in the casting.

Table 3. Risering Curve Data for 3.6% C, 2.5% Si Ductile Iron

Cast Size & Shape	Riser diam. in.	Remarks	Cstg. No.	F.R. ^a	V.R. ^b
2-in. dia. x 3 1/4-in.	2 1/4	Completely sound	352-2	1.15	.38
	2 1/2	Riser shrink	355-2	1.11	.20
4-in. cube	4 1/2	Completely sound	345-4	1.13	.12
	4 1/4	Riser shrink	348-5	1.10	.03
2 x 2 x 6 in.	3	Completely sound	253-1	1.18	.88
	2 1/2	Riser shrink	254-6	1.14	.78
2 x 6 x 9 in.	4 1/2	Completely sound	363-1	1.28	.78
	4 1/4	Surface shrink	364-5	1.25	.72
1 x 3 x 7 in.	2 1/2	Completely sound	256-4	1.32	.68
	2 1/4	Surface shrink	257-3	1.28	.59
1 x 4 1/2-in. R semicircle	3	Completely sound	422-4	1.41	.67
	2 1/2	Riser shrink	360-2	1.30	.51
1/2 x 2 1/4-in. R semicircle	1 1/2	Completely sound	363-2	1.42	.67
	1 1/4	1/4-in. riser shrink No centerline shrink	364-2	1.30	.51
1/4 x 1 1/4-in. R semicircle	1/2	Completely sound	364-1	1.41	.66
1 x 5-in. R semicircle	2 1/2	Centerline shrink	352-3	1.34	.48
	2 1/4	Surface shrink	355-3	1.29	.42
1 x 6-in. R semicircle	3 1/4	Centerline shrink	345-2	1.44	.48
1 x 5 x 10 in.	3 1/2	Centerline shrink	357-6	1.42	.48
1 x 4 1/2 x 9 in.	3 1/2	Centerline shrink	422-6	1.50	.67
1/2 x 2 1/4 x 4 1/2 in.	1 1/2	Centerline shrink	364-3	1.49	.66
1/2 x 2 1/2-in. R semicircle	1 1/2	Centerline shrink	357-1	1.38	.54
1/2 x 3-in. R semicircle	1 1/2	Centerline shrink	348-1	1.43	.47
1/2 x 4-in. R semicircle	1 1/2	Centerline shrink	338-1	1.57	.41
1/4 x 1 1/2-in. R semicircle	1/2	Centerline shrink	363-4	1.54	.60

^aF.R.—freezing ratio; ^bV.R.—volume ratio

Centerline shrinkage (Fig. 2b) away from the riser cannot, in general, be corrected by an increase in riser size. This type of shrinkage results from an inadequate thermal gradient from the riser to distant zones of the casting. The shrinkage zone is walled off by the rest of the casting from ample liquid metal in the riser. In the case illustrated, even a tenfold increase in riser size would not produce enough change in the thermal gradient across the entire casting to avoid the uniform solidification pattern which blocks liquid metal flow from the riser.

It is very important to notice that the remedies for these two types of shrinkage are distinctly different. For



Fig. 3 . . Castings used to determine risering curve.

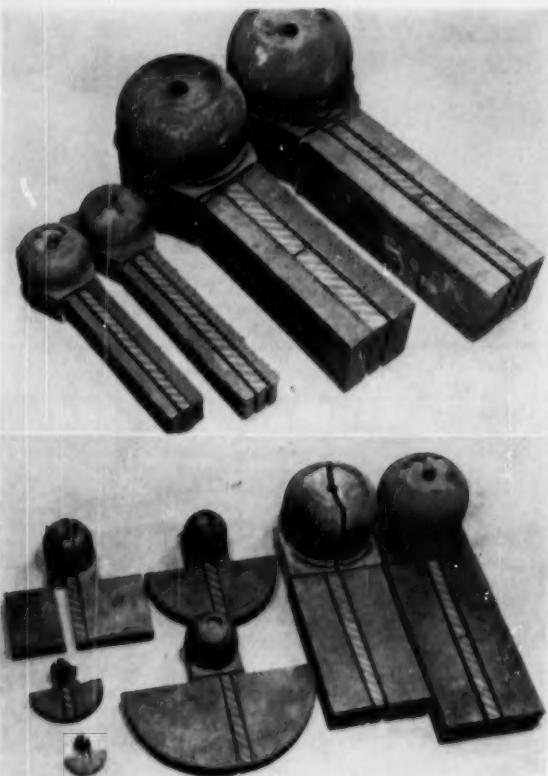


Fig. 4 . . Bar castings (above) and plate castings (below) used to make feeding distance measurements.

riser-neck shrinkage a larger riser is needed, while for centerline shrinkage either an increased number of risers, chill inserts in the mold, or casting design changes are necessary. For completeness it should be noted that instead of shrinkage voids at these locations, the cope surface may be sucked in toward the hot spot by the vacuum at this point; in this case surface shrinkage partly or completely replaces the internal shrinkage. The causes and remedies are the same as those just discussed. This is illustrated in Fig. 2c.

Since all castings may be considered as combinations of the simple geometrical shapes, it is logical to determine the feeding distance of risers in bars, plates, and cubes as a guide to proper riser placement in castings. It is evident from inspection that feeding distance in a cube is not a problem, since a cube is merely a very

short bar. Concern, therefore, will be with obtaining a quantitative expression for feeding distance in bars and plates.

Melting Practice. Melts were made in a 200-lb, basic-lined, high frequency induction furnace. Charges were composed of Lyle pig (under 0.05 Ti), Armco iron, and standard ferro-alloys. A 2 per cent addition of a nickel base, 15 per cent magnesium alloy was made to the ladle upon tapping at 2770 F. This was followed by an addition of 0.75 per cent Si as 85 per cent ferrosilicon. Cerium was added as mischmetal (0.015 per cent) in small pieces mixed with the ferrosilicon.

Castings were poured less than five minutes after tapping in the temperature range 2500-2590 F. Preliminary work established this range as preferable for sound castings.

Over 200 castings were poured and examined from 25 heats and complete data are available in Reports of Project 1862 of the Engineering Research Institute of the University of Michigan. Three analysis ranges were explored:

	% C	% Si
High carbon equivalent	3.9	2.5
Medium carbon equivalent	3.6	2.5
Low carbon equivalent	3.6	1.8

Since the results were approximately the same, only those for the more commonly used 3.6 per cent C, 2.5 per cent Si analysis are summarized in this report. Data for the key castings are listed in the appropriate tables and analyses were ± 0.10 per cent C, ± 0.2 per cent Si as shown in Table 1.

Molding. Riser size of the castings used for the determination of the risering curve are illustrated in Fig. 3. The dimensions were selected to provide a wide range of cooling rates.

Feeding distance was determined with the various bar and plate castings illustrated in Fig. 4 and described in the tables of data. Some of these castings also provided data for the risering curve. The green sand employed is shown in Table 2.

Inspection. In early work the principal criterion of soundness was careful visual inspection of sections through critical regions. This was more conservative than the technique Caine used in developing risering curves for steel, since the occurrence of flowed metal across shrinkage voids during cutting was minimized by sandblasting of the cut face. However, the increasing demand for radiographically sound castings prompted the use of radiographic inspection of all castings. Since the best sensitivity was obtainable with machined surfaces, the critical sections were cut out of each casting for radiographing as shown by the cross-hatched marks in Fig. 4a and 4b. Sensitivity is sufficient to disclose defects above 0.010 in. in size in any of the castings made.

As examples of this technique, in Fig. 5 the change in riser-neck shrinkage as riser size is increased is shown by radiographs. In Fig. 6 a typical set of radiographs illustrates the appearance of centerline shrinkage as effective feeding distance is exceeded.

Data may be divided into two principal groups for discussion: risering curve data affecting riser size, Table 3 and Fig. 1, 3, and 5, and effective feeding distance

Fig. 5a. Influence of riser size on riser neck shrinkage. Riser on specimen was 2 1/8 in. in diameter.

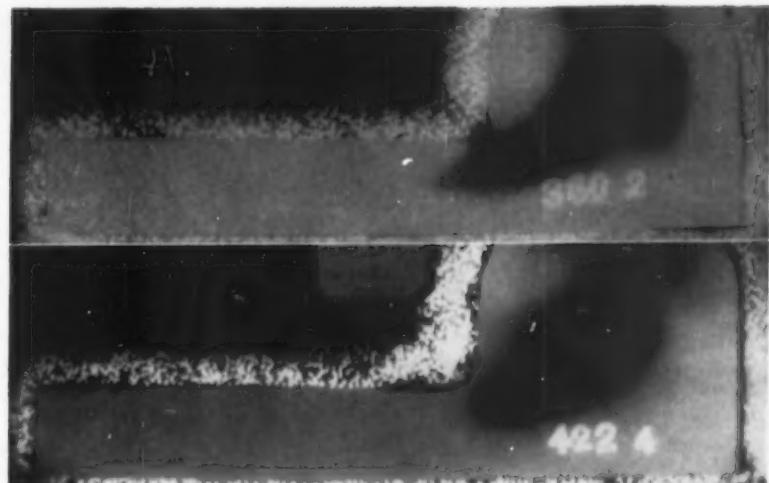


Fig. 5b. Same casting with 3-in. diameter riser is sound.

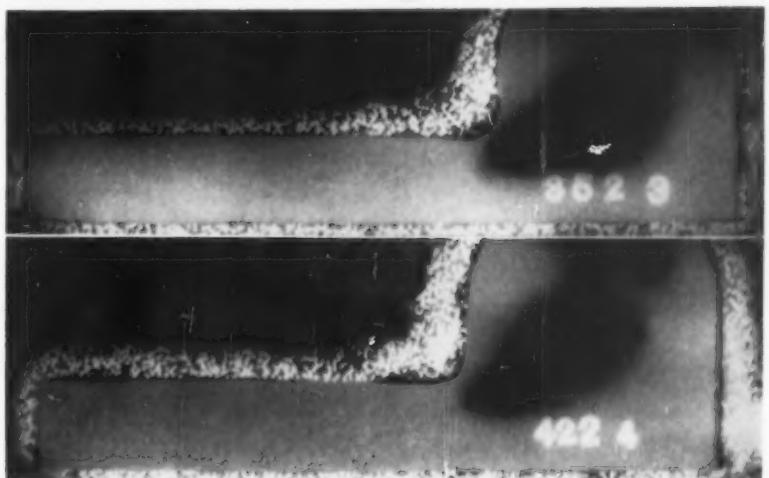


Fig. 6a. Centerline shrinkage with riser inadequate to feed 5 in.

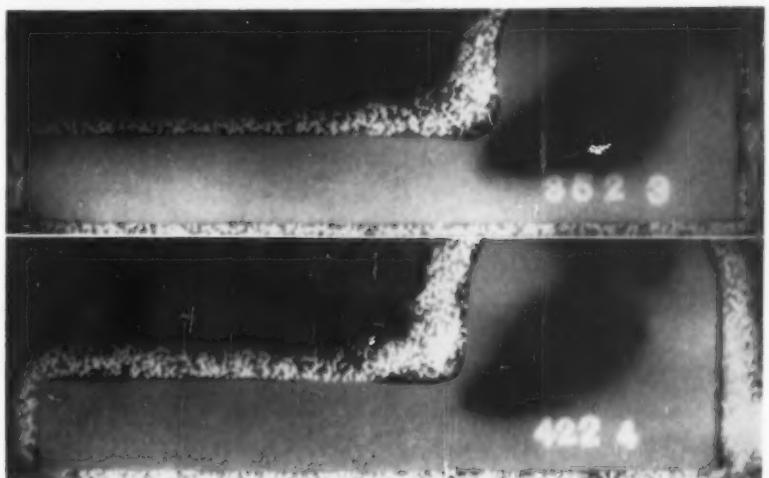


Fig. 6b. Sound casting with riser adequate to feed 5 in.

Table 4. Effect of Neck Dimensions on Feeding Distances

Casting Size & Shape	Riser Diam.	Neck Dimensions	Remarks	Cstg.	F.R.*	V.R.*
1 x 4 in.-R semicircular plate	2 1/4	1/2 x 1 1/8 x 1/2	Centerline shrink	295.5	1.33	.64
	2 1/4	1/2 x 2 1/4 x 1/2	Completely sound	325.1	1.34	.64

*F.R.—freezing ratio; V.R.—volume ratio

data affecting riser placement, Table 5 and Fig. 4 and 6.

Risering Curve Data. The application of the risering curve data of the type shown in Fig. 1 to the calculation of the proper riser size for a given casting has been rather thoroughly discussed.¹ In summary, to determine whether a given riser will avoid riser-neck shrinkage in a given casting (or portion of a casting if more than one riser is used):

1. Calculate the freezing ratio of the casting to the riser. Since the cooling rate of either riser or casting is proportional to the surface area/volume ratio,

$$\text{Freezing Ratio} = \frac{\text{Casting Surface Area}}{\text{Riser Surface Area}} = \frac{\text{Volume of Casting}}{\text{Volume of Riser}}$$

The freezing ratio must be greater than one for all normal cases of sound castings, since the cooling rate of the riser must be less than that of the casting in order to have liquid feed metal available while the casting is solidifying.

2. Calculate the volume ratio of riser to casting. (In steel the volume of liquid metal in the riser must be at least 3 per cent of the casting volume, since 3 per cent liquid-to-solid shrinkage takes place.)

For a given casting-riser combination these two values establish a point in Fig. 1. For soundness the point must lie to the right of the curve and preferably in the shaded area to obtain maximum yield. Several trial-and-error calculations (usually two are sufficient) rapidly establish the necessary riser size for soundness.

The risering curve graph has been established for radiographic soundness from the data of Table 3, as mentioned in the procedure. Proper riser neck dimensions are needed as shown by Table 4.

In general, necks of insufficient width have been employed in the production of plate-like castings.

It should be re-emphasized that the above data give only the side riser dimensions needed to avoid riser-neck shrinkage, and do not govern isolated centerline shrinkage, which is determined by effective feeding

distance. Center-line shrinkage is avoided by proper riser placement and will now be discussed.

Effective Feeding Distance Data (Riser Placement). As mentioned earlier, this problem resolves into the question "In a given bar or plate, how far will a riser feed?" It is assumed that the riser is large enough to avoid riser-neck shrinkage as calculated above. To answer this question, bars and plates of different lengths and cross sections were prepared (Fig. 4a and 4b, and Table 5). Comparison of these data with those obtained by Pellini for steel is indicated. In general the data are in remarkably good agreement.

With the availability of these data, the risering of a given casting employing side blind risers may now be calculated quantitatively. Top risering should receive study in the future.

Acknowledgment. The authors wish to acknowledge the expert assistance of Professor W. B. Pierce, Mr. Lou Ruffins and Mr. Randolph Gordon in many phases of this work. They also greatly appreciate the sponsorship of this work by the International Nickel Company and the permission to publish this report.

References

1. J. B. Caine, "A Theoretical Approach to the Problem of Dimensioning Risers," *TRANS. AFS*, vol. 56, pp. 492-501 (1948).
2. H. F. Bishop, and W. S. Pellini, "The Contribution of Riser and Chill Edge Effects to Soundness of Cast Steel Plates," *TRANS. AFS*, vol. 58, pp. 185-197 (1950).

Table 5 . . Feeding Distance for 3.6% C, 2.5% Si Ductile Iron

Castings Size & Shape	Riser diam. x ht., in.	Remarks	Csig. No.	F.R.*	V.R.**
2 x 2 x 10-in. long bar	4	Sound	352-5	1.48	1.26
2 x 2 x 11-in. long bar	4	Unsound	355-4		
2 x 2 x 9-in. long bar	3 x 4	Unsound	355-5	1.25	0.79
4 x 4 x 12-in. long bar	7 1/2 x 8	Sound	353-1	1.46	1.84
4 x 4 x 14-in. long bar	7 1/2 x 8	Unsound	349-1		
1/4 x 1 1/2-in.-R semicircular plate		Sound	364-1	1.41	0.66
1/4 x 1 1/2-in.-R semicircular plate		Unsound	363-4	1.54	0.60
1/4 x 1 1/2-in.-R semicircular plate		Sound	422-1	1.58	0.86
1/2 x 2 1/2-in.-R semicircular plate		Sound	363-2	1.42	0.67
1/2 x 2 1/2-in.-R semicircular plate		Unsound	357-1	1.38	0.54
1/2 x 2 1/2-in.-R semicircular plate		Unsound	364-3	1.49	0.66
1/2 x 4-in.-R semicircular plate	3	Sound	345-1	2.44	1.69
1/2 x 4-in.-R semicircular plate	1 1/2	Unsound	338-1	1.57	0.41
1 x 4 1/2-in.-R semicircular plate		Sound	422-4	1.41	0.67
1 x 5-in.-R semicircular plate		Unsound	338-2	1.39	0.54
1 x 4 1/2 x 9-in. plate		Sound	422-6	1.50	0.67
2 x 6 x 9-in. plate	6	Sound	360-1	1.56	1.58
2 x 6 x 9-in. plate	4 1/2	Sound	363-1	1.42	0.78
2 x 6 x 10-in. plate	6	Unsound	359-1	1.54	1.42

*F.R.—freezing ratio; V.R.—volume ratio

Brass and Bronze Round Table Luncheon 1955 AFS Convention

Monday Noon, May 23

This year again, the Brass & Bronze Div. will conduct its popular discussion session at the Round Table Luncheon it sponsors Monday noon, May 23, during the 1955 AFS Convention in Houston.

Feature of the luncheon meeting will be informal discussion of a number of questions by all who wish to participate. The following questions have been announced by B. A. Miller, Crown Non-Ferrous Foundry, Inc., Chester, Pa., chairman, Brass & Bronze Round Table Committee.

1. What means are used to insure a *practical* strength factor, when comparing test bar properties with properties obtained in the casting?
 - What is the effect of section size?
 - What effect does cooling rate have?
 - What effect does melt quality have?
2. Is there sufficient chemical segregation within a casting to affect the mechanical properties?
 - Are all copper-base castings alloys similarly affected?
 - If not, what causes the variations?
3. In melting and casting the high tensile bronzes, what are the main foundry difficulties encountered?
 - With aluminum bronze?
 - With nickel aluminum bronzes?
 - With manganese bronze?
 - With silicon brasses?
4. Is there any merit in superheating copper-base casting alloys?
5. What is the influence of combustion conditions

on the various copper-base alloys, such as:

- Tin bronzes?
- Aluminum bronzes?
- Manganese bronzes?
- What controls on fuel-fired furnaces are necessary to maintain:
 - Speed of melt?
 - Melt quality?
 - Efficiency of operation?
- What molding and core sand from your area would you use to make a 300-lb valve body from Navy M (88 Cu, 6 Sn, 2 Pb, 4 Zn), and why?
- What control standards are required to produce quality castings in natural and blended molding sands?
- What methods of gating and risering would you use to make pressure and non-pressure castings from:
 - High shrinkage alloys (aluminum and manganese bronzes)?
 - Low shrinkage alloys (red brass and tin bronze)?
- Is there a difference in melt quality in the copper-base alloys when melted in:
 - Indirect arc furnace?
 - Induction furnaces (low and high frequency)?
 - Gas and oil furnaces (crucible and open flame)?
 - Coke-fired furnaces?

Semi-Automatic Muller Control

THOMAS F. MURPHY / *Foreman, Foundry Maintenance
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Practical ideas, developed and proved in foundries and pattern shops, are presented on this page. Contributions may be of any length, preferably short, illustrated by photo or sketch.

■ Shortly after installing a 2000-lb manually controlled sand muller in the green sand system, it was decided that an automatic method for controlling the mulling cycle would relieve the operator for other duties and help maintain mulled sand properties.

The muller was equipped with a double-acting air cylinder which opened and closed the bottom discharge door. Control was with a manually operated valve.

Air piping and valves were added to the existing system in such a way that manual operation can be returned to immediately if electrical difficulties are encountered.

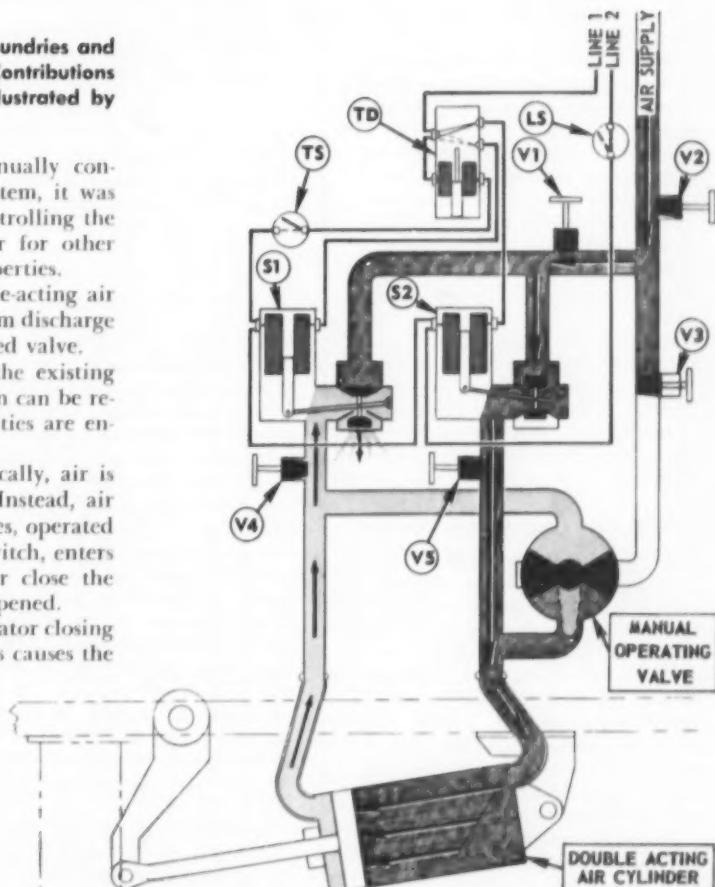
When the system is operating automatically, air is shut off from the manual control valve. Instead, air passing through one of two three-way valves, operated by solenoids and timed by a time delay switch, enters the double-acting air cylinder to open or close the muller door, depending on which valve is opened.

The automatic cycle begins with the operator closing the muller door by closing switch *TS*. This causes the coil of the time delay switch *TD* to be energized bringing the upper contacts together, in turn energizing solenoid *S₂* to cause a valve to open and introduce air to the right side of the air cylinder which closes the muller door.

As soon as sand to be mulled has been added to the machine the operator opens switch *TS*, thus de-energizing the coil of the time delay switch *TD* and initiating the timed cycle.

For the duration of the timed cycle *TD* remains in the upper position then falls and makes the lower contact, energizing solenoid *S₁* which introduces air through the valve it operates to the left side of the piston causing the muller door to open and discharge sand.

To repeat the cycle for the next batch, the operator closes switch *TS* again.



Electro-pneumatic system controls sand mulling cycle.

Manual operation may be quickly arranged by closing valves *V₄* and *V₅* and opening valve *V₃*. Valve *V₃*, of course, controls the air supply to both manual and semi-automatic operations.

Not shown on the diagram, is a red pilot light in series with solenoid valve *S₁* to indicate when the muller door is open and a green pilot light in series with solenoid valve *S₂* to indicate when the door is closed.



Accident Prevention in Action

Sixteen Ounces of Prevention

■ "An ounce of prevention is worth a pound of cure," goes a familiar proverb. This old saying may have been true in yesterday's foundries but today's foundries are almost all mechanized in some way. With accident prevention in mind, let us re-word that old proverb to read: "A pound of prevention is worth a ton of cure!"

Accidents, though, are not always caused directly by moving machinery. This is due to the fact that "pounds" of prevention have been designed into the equipment. Most injuries are sustained by individuals who use less than an "ounce" of prevention when they take chances, play around on the job, ignore safety rules, or let their minds wander to the golf course, the lake, or the coming vacation trip. Prevention of a mishap often begins first with our mental alertness to foresee danger in time to circumvent it.—James L. Turpin.

How a Safety Committee Works

■ Since the Safety Committee at our plant came into being a few years ago, a high degree of safe operation has been achieved and maintained. Both worker and company have benefited; the company through increased production and profit, and the worker through increased efficiency and improved morale and physical well-being. There has been a marked reduction in the number and character of accidents. In brief, our committee has done an outstanding and excellent job in accident prevention.

In examining the functions of the Safety Committee at our plant, one cannot but marvel at its broad scope and effectiveness. Our Safety Committee:

1. Formulates all safety plans and regulations, and enforces them.
2. Makes periodic inspections of the plant.
3. Consults the worker as to the need of corrections in safety conditions.
4. Has provided a rich and effective educational program to realize its purpose and goal of safety by publishing

and furnishing literature on safety; showing movies and enacting plays dealing with the theme of safety; posting safety slogans and instructive displays throughout the plant; conducting a safety campaign through safety contest; and holding frequent meetings where safety problems are discussed.—Nathan Saffren.

Theme of this year's Safety Letter Contest sponsored by the Malleable Founders' Society was *Accident Prevention*. Winners were announced at the January 21 semi-annual meeting at Hotel Cleveland, Cleveland.

Winner of the first prize of \$100 is James L. Turpin, cost department supervisor of the Indianapolis plant of National Malleable & Steel Castings Co. Second prize of \$75 was won by Nathan Saffren who works in the finishing department of the Buffalo, N. Y., plant of Acme Steel & Malleable Iron Works. Lawrence Kaelin, who last year won first prize, captured third prize this year for \$50. Kaelin, a co-worker of Turpin, is melting foreman at the Indianapolis plant of National Malleable. Also a winner again this year is W. B. Sobers, chief chemist in the Research & Development Div. of Chain Belt Co., Milwaukee. Sobers, who placed third last year, won the fourth prize of \$25.

Condensations of the prize letters give safety thoughts that can be applied in any foundry.

Barefoot Boys in Foundries

■ Management in the foundry industry can truthfully say that they've used every vehicle at their disposal to drop the accident toll. Most managers have as much pride in a non-accident month as they have in an unusually high sales month. (The manager at the plant where I work not only backs his safety

director 100 per cent, he himself wears safety shoes at the plant.)

We should no more come to work in a foundry without safety-toe shoes than we should come to work barefooted. If safety were sold by the foot would you buy any? Probably not; less than half the foundrymen wear safety shoes. Safety shoes are more comfortable now, so sporty they can be worn for dress-up and then worked down into the plant. At 25¢ a foot we foundrymen can't afford not to wear steel-toe shoes. (Retail price of one brand of safety shoe is only 50¢ a pair more than the same quality regular shoe.)

Safety shoes are just an inch ahead in price . . . two feet ahead in safety! —Lawrence Kaelin.

Safety Is Everybody's Business

■ Accident prevention is more complex than simply having a safety committee or safety director analyze an accident to determine the cause and how to correct it, or prevent it from recurring.

Complete safety equipment and the installation of the best safety devices are not enough to combat accidents. Before a foundry can benefit from accident prevention, it must view the problem in all its aspects and have full cooperation from all employees.

Responsibility for a safe plant starts with management. It isn't enough to authorize the spending of money for a safety program, provide safe surroundings, and safety equipment. It is up to management to see that interest in safety prevails through the entire plant.

In our company, a very important factor has been the foundry job placement program; fitting the worker's physical capabilities to the job's physical requirements so as not to jeopardize his or his fellow worker's safety.

Management of our company has been sincere in their support of safety. This effort has resulted in receiving safety awards by our foundry divisions and fabricating plants from the National Safety Council and the Wisconsin Council of Safety.—W. B. Sobers.

Foundry Facts

Furnace Emission Control

From the AFS publication CONTROL OF EMISSIONS FROM METAL-MELTING OPERATIONS.

Atmospheric pollution may be defined as the presence in air of man-made substances in concentrations sufficient to interfere with the comfort, safety, or health of man or with full use and enjoyment of his property. Since no measurable injury to human health has been directly traceable to neighborhood air pollution by a foundry, the industry's problem is mainly one of creating a possible nuisance.

A nuisance in a residential area may not be considered such in an industrial area. There is an increasing acceptance in air-pollution regulation for restricted legal liability for nuisances in an industrial area. Factors which determine what air pollutants reach ground level in industrial, business, and residential districts is determined by the topography and meteorology of the surrounding country, as well as the height of industrial stacks.

While the dramatic air-pollution difficulties at Donora, Pa., in 1948 served to focus public attention on atmospheric pollution as a community problem, it should be noted that the Donora incident was not caused by foundry dusts. Sizes of air-suspended materials which cause air pollution are measured in microns. A micron is so small that 25,400 micron lengths are equal to only one inch. Particles from metal melting are even smaller; the majority may vary from one-half down to one-hundredth of a micron. These smaller sized particles have the greatest tendency to remain air-borne and therefore are exceedingly difficult to collect. Strangely, a single particle less than one-half micron in size cannot be seen with an optical microscope, although the presence of many particles in furnace-stack gases is easily visible to the naked eye.

Dust, fume, and smoke commonly present in gases emanating from melting operations may be classified as to particle size and the manner in which they are generated.

Dusts are formed from solid, inorganic or organic materials by physical force such as crushing, grinding, and high temperatures. Particle size ranges from microscopic to submicroscopic. Particles above 50 microns in size settle quickly. Fly ash air pollutants are included among dusts.

Fume is a term applied to fine solid particles dispersed in air or gases and formed by condensa-

tion, sublimation, or chemical reaction such as oxidation of metals.

Smoke results from incomplete combustion and consists predominantly of small gas-borne particles of combustible material present in sufficient quantity to be observed independent of other solids in the gas stream.

Mist is a visible emission usually formed by condensation or a vapor-phase reaction, the liquid particles being large enough to fall by their own weight.

Gas is a formless state of matter completely occupying any space.

Gas from furnaces usually contains dust, fume, and smoke particles, the proportion of each depending on the type of material charged, the temperature, and the phase of the melting cycle.

The casting industry has become one of the foremost users of industrial dust collecting equipment in its efforts to remove internal dust and fumes. Effective control of melting emissions is complicated by several factors.

In contrast with other foundry operations, melting operations produce large volumes of ultra fine dust which passes through what is normally considered a high efficiency dust collector and is the part of stack gases that is clearly visible in the characteristic plume.

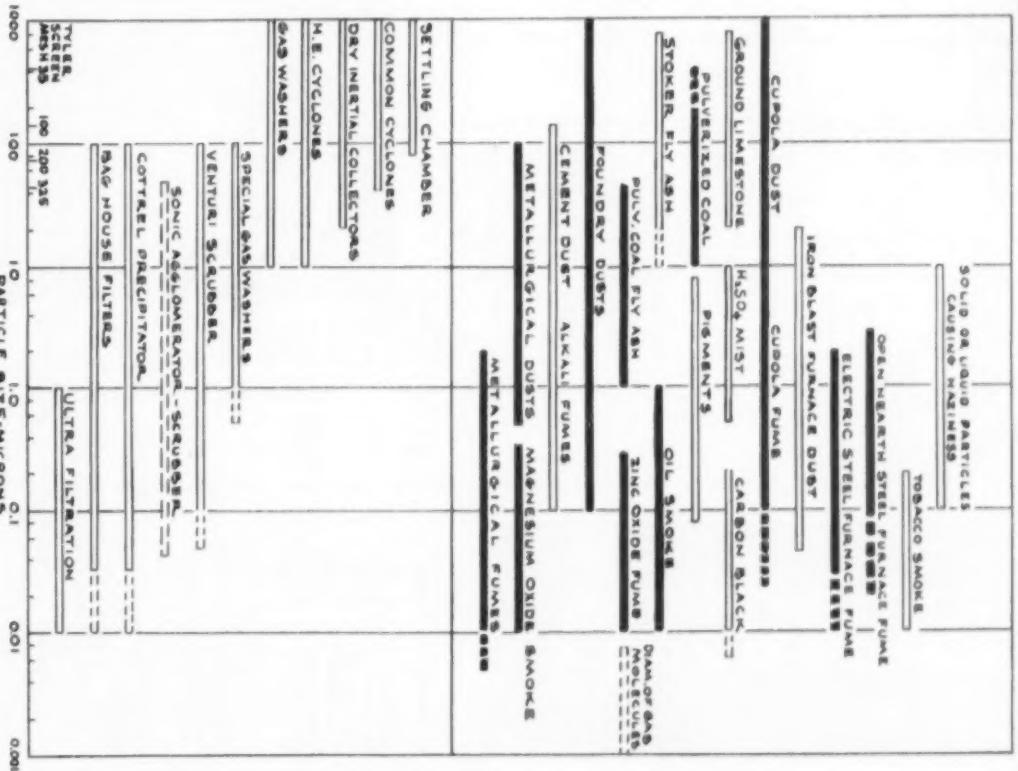
Before high temperature furnace stack gases can be handled satisfactorily by most conventional types of dust collectors the gases must be carried through refractory lined or heat-resistant alloy ducts and cooled.

Furnace stack gases are of extremely large volumes; when cooled by diluting with air even larger volumes are involved. Large-size dust collectors are expensive.

One complicating factor in using cooling water is corrosion due to either the nature of the water or to gases absorbed by the spray.

Benefits of air-pollution-control equipment seldom appear as reduced operating costs. Inexpensive dust collectors are not apt to be effective; medium-efficiency collectors are expensive; and ultra-high efficiency collectors are very expensive. Particles above 50 microns in size settle quickly.

The table on the reverse side is a summary of data on particle size, concentration, and emission rate of solids in furnace gases.



Graphical representation of particle size ranges of dust and fumes from typical industrial operations, with approximate operating ranges of control equipment.

Foundry Facts

Furnace Emission Control

Table 1—Typical Data on Furnace Gases

Type Furnace	Data Source	Size	Product	Stack Gas Volume			Max. Temp., F	Grains/ SCF	Lb/Hour	Lb/Ton Charge	Mesh	Particle Size—Weight Micron	Per Cent
				Lb/Melt	Lb Charge	*SCF/ Lb Melt							
Cupola	Name ^(a)	Avg. of 3	Gray Iron	32:91			1200-1700	0.6-1.6	69-196	14.8-29	100	16-24	16-18
Cupola											325	200	13-32
Cupola	l'Anson ^(b)	54in. ID	Gray Iron		67.5		1400	1.15	174	22			4.8-13.3
Cupola	Radcliffe ^(c)	60in. ID	Gray Iron				290	.07-.32				25-10	3.4-15.9
Cupola	(Meltdown)											10-5	1.4-13.3
Cupola												—5	4.1-10.6
Cupola	(Normal Op.)												
Cupola	Wetheridge ^(d)		Gray Iron	7.8-23.4 (Combustion gas)	0.5-1.5	1-10	1076	1.24-3.45 0.2-13.5					
Arc Furnace	Allen ^(e)												
Arc Furnace	Kane ^(f)	3-6 T	Slt. Categ.										
Arc Furnace	Zang ^(g)	50-75 T	Slt. Ingots										
Open Hearth	Allen	3 T	Slt. Categ.										
Open Hearth	Bishop ^(h)	225-250 T	Slt. Categ.										
Open Hearth	Vaidya ⁽ⁱ⁾	58 T	Sec. Metal										
Open Hearth	Roberts ^(j)		Slt. Mfr.										
Open Hearth	Jones ^(k)		Slt. Mfr.										
Brass Furnaces (Average)	Allen	Variable	Brass Categ.										

* At stack temperature

SOURCES

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- (b) l'Anson, J. E., Hensell, T. L. Jr., and Pring, R. T., AMERICAN FOUNDRYMAN, Jan. 1933.
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*Stack gas corrected to std. cu. ft. at 70F, 29.92 in. Hg. is called standard air.



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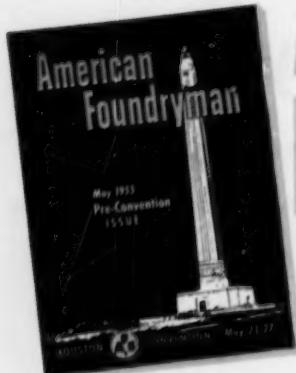
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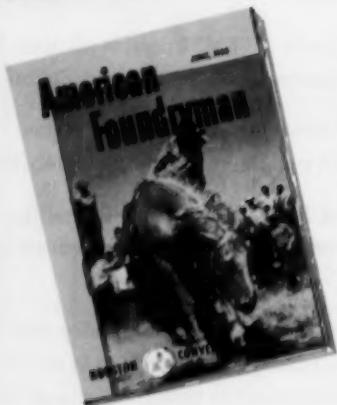
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Foundry Films Available

Six films or film series on foundry subjects are available from the American Foundrymen's Society. They are suitable as teaching aids in high schools, vocational schools, and colleges, or in apprentice training programs and most are also suitable for showing to non-technical groups.

"Effect of Gating Design on Casting Quality," a 35-min, 16-mm, color, sound movie, is rented at \$20.00 per showing. The film is on the findings of AFS-sponsored research on the hydrodynamic behavior of metal poured into a mold. It shows the effect of design changes in the gating system to eliminate metal turbulence and the aspiration of gases.

"Men and Molds," a 35-min, 16-mm, black and white, sound movie, depicts gray iron foundry operations of the Lynchburg Foundry Co., Lynchburg, Va. Two copies of the film were donated to the AFS Film Library by the company.

"The Invisible Shield," a 23-min, 16-mm, color, sound movie, shows modern foundry equipment for handling raw materials through cupola charging; for melting, hot metal distribution, and pouring; for sand preparation, molding, and shakeout; and for cleaning, inspection, and shipping of castings. It explains dust and fume control in these operations and in building ventilation. The film was donated to the AFS Film Library by Claude B. Schneible Co., Detroit.

"A Career in Metal," is a 55-frame, 30-min, color filmstrip for loan or purchase. Produced under the sponsorship of the Northwestern Pennsylvania Chapter, AFS, the film is suitable for showing to high school students, service club members, vocational counselors, etc.

"Foundry, Forging, and Heat Treating Occupations," a 35-mm, black and white filmstrip, calls attention to the training needed, working conditions, and wages and possibilities for advancement in these occupations.

"Foundry Technique," ten 35-mm, black and white filmstrips produced in England for apprentice and in-plant training, and accompanying lecture notes cover: No. 1. Ramming Green Sand Molds; No. 2. Mold and Core Ventilation; No. 3. Fixing Cores in Position; No. 4. Making a Simple Two-Part Bench Mold; No. 5. Forming the Runners and Pouring; No. 6. Loam Molding; No. 7. Closing the Mold; No. 8. Casting Design; No. 9. Machine Molding; and No. 10. Foundry Plant and Operations.

To rent the gating design film, request order forms from American Foundrymen's Society, Golf & Wolf Roads, Des Plaines, Ill., Attention: Technical Director. All other films may be obtained from the Society by describing the film desired, identifying the organization viewing the film, stating three choices of date and time of showing, and indicating the person, firm, and address—(1) requesting the film, (2) to receive the film, (3) responsible for returning the film within 24 hours after its scheduled showing, and (4) to be charged with shipping costs.

The six films available from the AFS Film Library are among 278 listed in the AFS Film Directory.

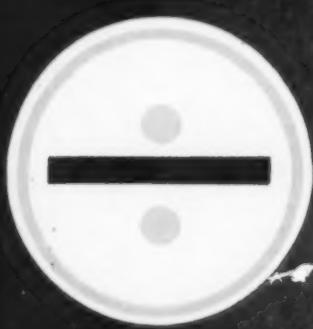
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Discussing Wisconsin Regional program, left to right: Prof. Edwin R. Shorey, University of Wisconsin; AFS Director C. V. Nass, Beardsley & Piper Co., Chicago; (standing) Wisconsin Chapter President Robert V. Osborne, Lakeside Malleable Castings Co., Racine; AFS President Frank J. Dost, Sterling Foundry Co., Wellington, Ohio; and Dean Kurt F. Wendt, College of Engineering, University of Wisconsin.

Cover Melting, Coremaking, Cleaning At Wisconsin Regional Conference

Reporting of the 18th Annual Wisconsin Regional Foundry Conference with its two-day series of five simultaneous technical sessions is made possible by chapter-member reporters under the direction of Donald M. Gerlinger, Walter Gerlinger, Inc. Photographs are by Walter Napp, Delta Oil Products Co.

OVER 700 foundrymen attended 20 technical sessions, two luncheons, and the annual banquet of the Wisconsin Regional Foundry Conference at the Hotel Schroeder, Milwaukee, February 10 and 11. The conference was sponsored by the Wisconsin Chapter of AFS in cooperation with the University of Wisconsin and the University of Wisconsin Student AFS Chapter. Directing the conference were Wisconsin Chapter President Robert V. Osborne, Lakeside Malleable Castings Co.; Conference Chairman and Chapter Vice-President P. C. Fuerst, Falk Corp.; and Program Chairman Norman N. Amrhein, Federal Malleable Co.

President Osborne opened the conference at the Thursday morning general meeting. AFS National President Frank J. Dost, Sterling Foundry Co., Wellington, Ohio, commended the chapter for the work of its officers and members who planned the conference. He outlined activities of the AFS and highlighted such operations as technical committee work, research, publications, education, safety, hygiene, and air pollution, **AMERICAN FOUNDRYMAN**, conventions and exhibits, and chapter activities. More than 700 men are in national committee work of the Society.

Conference Associate Chairman Prof. Edwin R. Shorey, University of Wisconsin, introduced Dean Kurt F. Wendt, College of Engineering, University of Wisconsin, who pointed out the partner relationship between industry and education in *"Our Mutual Concerns."* He commended the foundry industry for its activities in training men and attracting young men into castings production. He cited the AFS educational program and F.E.F., but said industry could still do more. Many who start, never finish their formal education and some who do, don't utilize their talents and education fully. The problem is to identify top talent in junior high school and to see that these individuals get proper broad education as a basis for later specialization.

President Osborne introduced AFS National Director C. V. Nass, Beardsley & Piper Co., Chicago, who spoke on *"Some Impressions of European Foundries."* He commented briefly on his participation as official AFS representative at the 1954 International Foundry Congress in Italy during a 5-week business trip in the fall of last year. He visited foundries in Germany, Italy, Switzerland, France, Belgium, Sweden, and England. He remarked that Germany has performed the greatest comeback of any European country and noted that their foundries, in general, practice unusually good housekeeping.

Conference Chairman Fuerst presided over the Thursday luncheon at which Arthur A. Agostini, Grede Foundries, Inc., spoke of the lack of individualism

of people today, of the trend toward collectivism, and dependence on government to solve problems of individuals in *"Common Sense for a Common Good."*

After the conference banquet Thursday evening, President Osborne introduced C. G. Arps, Allis-Chalmers Mfg. Co., who spoke on *"Are Your Books Balanced?"* At the Friday luncheon Chairman D. R. Hutchison, American Motors, introduced H. E. Goodnough of the Milwaukee Braves who spoke on *"Baseball, a Fulfillment of Our American Dream."*

Two of four five-simultaneous, technical sessions took place Thursday afternoon. The third session was held Friday morning and the fourth in the afternoon. Sectional meetings were held for steel, gray iron, malleable iron, non-ferrous, and pattern interests.

Steel sessions included quality control, metal penetration, risering, and cleaning room practices. Chairman of the first steel session was Donald Helman, Crucible Steel Castings Co. B. A. Lawson, Harrison Steel Castings Co., Attica, Indiana, stated in *"Quality Control in the Melting Dept."* that his firm tries to control chemistry, mechanical properties, and castability. He presented illustrations of typical standards. Co-Chairman E. G. Tetzlaff, Pelton Steel Castings Co., reported the session.

"Further Studies on Metal Penetration" was the title of the paper presented by Dr. R. C. Emmons, University of Wisconsin, at the second steel session. Dr. Emmons showed a movie that illustrated the fact that liquid steel will not wet

sand. Under reducing atmospheres of H_2 , N_2 , CO , or slightly moist CO , steel melted quietly into a liquid button that did little or no damage to either a quartz or sand boat. However, under oxidizing atmospheres of CO_2 , moist N_2 , or air, molten steel reacted with the atmosphere producing oxides that wetted the boats completely and usually destroyed them.

Dr. Emmons explained the mechanism of penetration, then presented data that showed the penetration metal to be significantly different from its parent metal.

Of the three elements necessary for penetration according to Dr. Emmons, moisture and carbonaceous material are present in every sand mold. Pressure, the third element, is developed all too easily. To prevent penetration, Dr. Emmons recommends sand permeability and vents to allow evolved gases every opportunity to escape rapidly. Session chairman was Anthony Herrmann, Belle City Malleable Iron Co., Co-Chairman David C. Zuege, and Reporter Max M. Miezzo are with Sivyer Steel Castings Co.

At the Friday morning session J. B. Caine, consultant, Wyoming, Ohio, spoke on "Rising for Magna Flux Inspection." Considering a "T- section" on its side (—) Caine said a top open riser allows for a bad hot tear; side risers accentuate hot spots and produce hot tears also; risering off the end of the T-junction is best. Caine pointed out that running too much metal over sand displaces the thermal center by causing sand at the bottom to be at a much higher temperature than sand opposite.

Intercolumnar shrinkage, which is associated with centerline shrinkage and indicates improper feeding, must not be confused with hot tears. Intercolumnar shrinkage often extends to the casting surface. Magnetic particle inspection shows up intercolumnar shrinkage even in very small amounts. Because these ruptures are sharp, service life is shortened; round defects are not as undesirable, said Caine.

Hot tears may be controlled to a certain extent by keeping sulphur and phosphorous content low and carbon above or below 0.20 to 0.30 per cent. Chills can be used to eliminate both intercolumnar shrinkage and hot tears. Zircon sand, also, can be used to advantage, and pouring on the cold side reduces tendency for both defects reminded Caine. Session chairman was Vincent Mikelonis, Grede Foundries, Inc.; co-chairman and reporter was John McBroom, Stainless Foundry & Engineering, Inc.

"Cleaning Room Practices" was the subject of the afternoon panel discussion by Stanley G. Lipinski, Pelton Steel Castings Co.; Stephen Kline, Crucible Steel Castings Co., Div. of Ebaloy, Inc.; and Lloyd Olson, Bucyrus-Erie Co. Emil Martinek, Maynard Electric Steel Castings Co. was chairman; co-chairman and reporter was Erich M. Sobota, Wisconsin Electric Power Co.

Flow diagrams and cleaning room practices were presented for a 650 ton/mo. small castings jobbing shop; a 1150 ton/mo. jobbing shop with separate arrangements for handling small, medium, and large castings; and a high production captive foundry. Olson stated that risers

on machined surfaces are not ground if cut reasonably close. He also told of the advantages of water-blast cleaning methods. All three firms represented by the panel had some method of premium pay; whether it was individual piece work or group incentive. Olson commented that due to the undesirable conditions of chipping he felt that it wouldn't be long before chipping would be a thing of the past.

Gray iron sessions covered physical testing, core sand practice, cupola lining developments, and a review of sand bonding processes. At the first gray iron session Prof. Philip C. Rosenthal, University of Wisconsin, presented "Significance of Physical Testing of Gray Iron." T. H. Tanner, Zenith Foundry Co., was session chairman; Carl J. Risney, Risney Foundry Equip. Co., was co-chairman and reporter. Reasons for testing according to Prof. Rosenthal, were to insure conformity to specifications, determine if a new alloy or process is working, and to gather test data so that new specifications can be set up. He reviewed the gathering of test data from bars, test grate on pattern, sample from casting, test castings, and non-destructive testing of the casting.

O. Jay Myers, Archer-Daniels-Midland Co., Minneapolis, threw a quiz at the afternoon session, "Core Sand Practice—Fact or Fiction." The 20 true or false statements involved the nature and importance of core mix ingredients, mixing cycle, effects of baking, and core tests. It was agreed that although resin or core oil binder provided handability this same property could be obtained by using concrete cement; collapsibility was at least an important reason for using resin or core oil binders. Chairman of the session was Leslie J. Woehlke, Spring City Div., Grede Foundries Inc.; co-chairman and reporter was Frank M. Kulka, Motor Castings Co.

T. J. Wilde, National Carbon Co., Div. of Union Carbide & Carbon Corp., New York, spoke of carbon-block cupola lining in "Carbon and Graphite in the Foundry," at the Friday morning session. He recounted the development of carbon refractories in blast furnace operations and of applications and benefits of this refractory in cupola operations. H. W. Schwengel, Modern Equipment Co., was session chairman; James E. Burke, Wis-

consin Gray Iron Foundry Co., was co-chairman and reporter.

"A Review of Sand Bonding Processes" was presented at the afternoon session by F. S. Brewster, Harry W. Dietert Co., Detroit. In discussing various processes from inexpensive green sand to lost wax, Brewster stated the best results from each were obtainable only with proper control. He told of the possibility in the near future to produce molds in green sand at the rate of 600 per hour. Session chairman was Joseph J. Broecker, Lakeside Malleable Castings Co.; co-chairman and reporter was E. C. Wussow, Kaukauna Machine Corp.

Malleable iron sessions covering, in addition, melting controls, annealing problems, and dielectric core baking started with Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, speaking on "Casting Defects as Related to Sand Practice." Barlow discussed defects and causes for several conditions of sand, high and low: green strengths, mulling, carbon content (seacoal and gas), hot strength, toughness, and flowability; and sand impurities. Paul R. Martin, Milwaukee Malleable & Gray Iron Works was session chairman; Co-Chairman Fred E. Katzenaki, International Harvester Co., Waukesha reported.

Speaking at the second session on "Malleable Melting Controls," Lawrence E. Emery, Marion Malleable Iron Co., Marion, Ind., discussed practices at his plant. Emery said templates were used to check cupola walls and sand bottom. Wood and coke are measured and lighting off follows a standard procedure. Chemical analysis is determined frequently for cupola and air furnace metal; and cupola slag is analyzed several times each day. Test sprues are poured for primary graphite observations and green sand and dry sand molds are poured to test fluidity.

Emery explained that combustion control is accomplished by continuous sampling of furnace atmosphere at the center of the rear bridge wall. Coal-air ratios are manipulated to provide desired atmosphere. Emery credited this control with overcoming some of the handicaps of cupola-air furnace duplexing to produce consistently high quality malleable iron. Ralph N. Schaper, Appleton Electric Co.,



From Milwaukee, left to right: Ticket Chairman Burleigh E. Jacobs, Jr., Grede Foundries, Inc., and Chapter Treasurer Bradley H. Booth, Carpenter Bros.; luncheon speaker Arthur A. Agostini, Grede Foundries, and Chapter Vice-President, Paul C. Fuerst, Falk Corp.

Foundry Div., was session chairman; Co-Chairman W. J. MacNeill, Badger Malleable & Mfg. Co., reported.

"Annealing Problems Arising From Melting Irregularities" was the subject of the paper presented by Prof. Richard W. Heine, University of Wisconsin, at the Friday morning session. Donald E. Feather, Appleton Electric Co., Foundry Div., was chairman; Co-Chairman, Martin A. Harder, Lakeside Malleable Castings Co., reported that Prof. Heine defined four types of furnace atmosphere: exothermic oxidizing (from raw air), endothermic oxidizing (CO_2), less endothermic ($CO_2 + CO$), and reducing (CO). Heine said first and second stage annealability was maximum with reducing atmospheres, and greatest resistance to annealing resulted from exothermic oxidizing atmospheres.

Prof. Heine said second stage graphitization and mechanical properties are adversely affected by high moisture content in the furnace atmosphere. Moisture and hydrogen content of the fuel must be considered along with moisture in the air. Melting atmosphere can be determined by comparing charge with final metal composition.

At the fourth malleable session, W. H. Hickock, Thermex Div., Girdler Co., Louisville, Ky., presented "Dielectric Core Ovens." After explaining the theory of dielectric baking, Mr. Hickock told how the size of oven was determined by the water content of the sand. He showed graphs of the increased efficiency of high frequency baking. Hickock explained that metal could be put through the oven with the core if the two were separated by cardboard. He told also, how driers can be made of coresand. Chairman of the session was C. A. Stegemeyer, Federal Malleable Co.; Donald Feather was co-chairman and reporter.

Nonferrous interests were rewarded with papers on gas and its control, melting and fluxing, sand resin practice, and an information forum. Donald L. LaVelle, Federated Metals Div., American Smelting & Refining Co., South Plainfield, New Jersey, opened the non-ferrous sessions with "Gas and its Control in Aluminum Alloy Castings." Otto A. Sadosky, Kenosha Brass and Aluminum Foundry, was chairman; Kenneth L. Jacobs, Standard Brass Works, was co-chairman and reporter.

Mr. LaVelle said the only gas aluminum foundryman need be concerned with is hydrogen, which is derived from reaction of molten aluminum with water or water vapor from products of combustion, humidity in the air, moist metal charge, tools, or fluxes. He said hydrogen is soluble in molten aluminum, but essentially insoluble in solid metal; causing porosity or pinholes in castings. Because solubility increases with temperature, overheating brings on excessive porosity.

Hydrogen may be removed by bubbling nitrogen or chlorine through the melt or by plunging tablets of a chlorinated hydrocarbon. LaVelle told how effectiveness of degassing is indicated by solidifying a sample in a partial vacuum which exaggerates porosity. LaVelle said the presence of gas is not necessarily detri-

mental as completely degassed aluminum shrinks excessively and is difficult to handle.

David Stein, Samuel Greenfield Co., Inc., Buffalo, New York, presented "Melting and Fluxing of Non-Ferrous Alloys" to the second session. Mr. Stein prescribed simple tests as sound of furnace operation, color of flame, and the zinc test to control combustion and obtain best melt results. Although one must be concerned with CO_2 , CO , H_2 , O_2 , N_2 , H_2O , water vapor, and hydrocarbons; H_2 and water vapor give the most trouble in melting.

Stein recommended the following rules for good operation: control combustion, start with hot furnace, use clean dry metal, do not overheat, degassify properly, and check operations. Edward H. Jagmin, Jr., Ampeo Metal, Inc., was session chairman;

at which the casting was poured rather than the temperature to which it may have been heated.

Pattern making sessions covered prevention of blow-by, pattern quality, pattern casting practices, and patterns for high pressure molding. Richard Olson, Dike-O-Seal, Inc., Chicago, presented recent developments in preventing blow-by in his paper, "Sealing Metal Core Boxes," to the first patternmaking session. He told how loose pieces can be sealed within the box. Olson claimed that the method of preventing blow-by he presented insured consistent core density and permeability, reduced core patching and mudding, makes brass and steel parting facings and high closing pressures unnecessary, made lighter corebox construction possible and blow-in core driers practical, increased production due to reduced maintenance, was safer due to elimination of blow-by, and costs less over-all than brass and steel facings. H. Wesley Stokes, Kilbourn Pattern Co., Inc., was chairman; Walter Kollmorgen, Walter Kollmorgen Pattern Works, was co-chairman and reporter.

At the second session, James M. Barrabee, International Harvester Co., Chicago, presented "Quality in a Pattern Shop." Barrabee said decimal tolerances and illegible prints which complicate pattern-making should be clarified by the customer rather than try to out-guess the prints. Pattern vault storage with temperature control and good records are part of quality control in the pattern shop. Session chairman was Martin C. Ehrman, Jr., International Harvester Co., Milwaukee Works; co-chairman and reporter was Gilbert J. Williams, Trackson Co.

A. F. Pfeiffer, Allis-Chalmers Mfg. Co., spoke to the Friday morning session on "Good Pattern Casting Practices." Mr. Pfeiffer discussed model construction and marking, special projects, the use of sweeps for rush jobs, special pattern equipment, and apprentice programs. Joseph W. Costello, American Hoist & Derrick Co., St. Paul, Minn., chairman of the Executive Committee of the Pattern Division of AFS told of progress in the revision of the PATTERNMAKER'S MANUAL. Harry Arneson, Spring City Pattern Works, Inc., was session chairman; Michael C. Frankard, J. E. Gilson Co., was co-chairman and reporter.

Thomas E. Barlow, speaking for the second time at the conference, presented "Pattern Equipment for High Pressure Molding" to the final pattern session. Mr. Barlow reminded the members that precision castings require precision patterns. He recommended cope and drag equipment be located with dowels to the molding machine anvil to allow for quick pattern changes. He said there was little change from conventional risering and spruing except that pouring cups are sometimes fastened to the diaphragm and are pressed into the mold during the mold squeeze operation.

Steve Denkinger, Atlas Plastic & Aluminum Pressure Plate Co., was session chairman; R. J. Christensen, Wisconsin Pattern Works, Inc., was co-chairman; and Wesley Stokes reported.



First woman to attend a Wisconsin Regional Conference is Margaret Love, casting expeditor, Allis-Chalmers Mfg. Co., West Allis.

Co-Chairman Henry Seboth, Western Metal Co., reported.

Dallas C. Amburn, Allied Chemical & Dye Corp., Pontiac, Mich., presented "Resins Used in the Non-Ferrous Foundry" at the Friday morning session. A. B. Cudnik, Federated Metals Div., American Smelting & Refg. Co., was chairman and Lawrence Oertel, Racine Aluminum & Brass Foundry Co., was co-chairman and reporter. Among the advantages of resin binders Mr. Amburn included: quick drying which saves oven fuel and reduces the number of driers necessary; hard surfaces ideal for non-ferrous work; easy collapsibility; low water content which increases blowability; and reduction of core oil by as much as 50 per cent.

The afternoon session consisted of an "Information Forum" of Messers. LaVelle, Stein, and Amburn, moderated by M. E. Nevins, Wisconsin Centrifugal Foundry Inc. Session chairman was Carl Van Buren, Speciality, Inc.; co-chairman and reporter was L. J. Andres, Lawran Foundry Co. The panel suggested that material covering the melt may introduce moisture to the melt thereby gassing it. Although the disadvantages of destructive fracture testing were agreed, x-ray inspection was considered difficult to interpret. Answering a question on the effects of overheating on grain size, the panel said grain size was determined by the temperature

News of Technical Committees

Recent Committee Meetings

Dust Control & Ventilation Committee, Louisville, Ky., Mar. 8
Air Pollution Control Committee, Chicago, Mar. 9
Safety, Hygiene, and Air Pollution Control Steering Committee, Chicago, Mar. 10
Committee 4-Q, Educational Div., AFS Technical Center, Des Plaines, Ill., April 5

Meeting Reports

Joint Meeting of Publications & Casting Defects Handbook Revision Committees (8-S). George W. Anselman, Foundry Services, Rockton, Ill., Chairman of 8-S, presided over the joint meeting at the Statler Hotel, Cleveland, Jan. 26.

It was brought out that ANALYSIS OF CASTING DEFECTS has unusually wide acceptance, being the only AFS publication to be translated into four foreign languages. It is used in many foundries in settling disputes within their own organization as well as between purchasing agents and inspectors. It has contributed greatly to the standardization of nomenclature, a better understanding of defective conditions and their causes, in addition to stimulating concerted efforts

for their elimination or improvement.

Frank J. Dost, Sterling Foundry Co., Wellington, Ohio, president of the American Foundrymen's Society, informed the meeting that the Board of Directors has agreed work should continue on the revision.

The two committees jointly recommended the following:

1. "Controlling Casting Quality" as a tentative title.

2. Scope of the book be enlarged to include all cast metals.

3. The new publication include, in a detailed manner, measures to eliminate specific defects as well as clear definitions of these defects.

4. Influence of design on defective conditions be emphasized and specific recommendations for producing sound castings through casting design be included.

5. Relationship of defective conditions to the serviceability of castings be evaluated.

A particle was defined as to properties, size, shape, structure, composition, and surface and the relation of size and shape to surface was discussed, as well as structure and composition relationships.

Assignments for discussion at the next meeting were made on determining particle size by sedimentation, elutriation, and sieving, and on determining surface by chemical, physical, and electrical methods.

Control Melting Emissions

"CONTROL OF EMISSIONS FROM METAL MELTING OPERATIONS," prepared by the Air Pollution Control Committee and approved by the Steering Committee of the Safety, Hygiene, and Air Pollution Program has just been published by the American Foundrymen's Society.

This publication presents information which will enable any foundryman to determine what steps he should take to control air pollution and continue to operate as a good neighbor and to comply with local air-pollution ordinances now in effect or possibly forthcoming.

Subjects covered are general information of air pollution and its control. Engineering characteristics of various types of equipment in actual service for controlling emissions from metal melting operations are described.

Atmospheric pollution, dust particle size, and the nature of solids in furnace stack gases are defined. A graphical comparison is made of particle size ranges of dust and fumes from typical industrial operations and the approximate operating ranges of control equipment.

History of atmospheric pollution codes and control ordinances is presented. Ordinances of 60 cities in 23 states are tabulated for comparison. Los Angeles County and Allegheny County, Pa., Air Pollution Control Codes and the A.S.M.E. Model Smoke Law are discussed in particular.

AFS member price is \$1.50; non-members, \$2.25. Write to American Foundrymen's Society, Book Department, Golf & Wolf Roads, Des Plaines, Ill. Postage will be prepaid if remittance accompanies order.

CASTING through the Ages



Foundry Tradenews

Standard Oil Development Co. has changed its name to Esso Research and Engineering Co. The change is solely one of company name. All personnel and mail addresses remain unaffected.

Charles L. Jarvis Company has changed its name to Jarvis Corporation.

Santa Rosa Brass, Bronze & Aluminum Foundry, Santa Rosa, Cal., has just published a 12-page booklet entitled "A Visit Through One of the Most Unusual Foundries in America."

Pelton Steel Casting Co., Milwaukee, through its newly formed subsidiary, Pacific Alloy Engineering Corp., purchased the stainless alloy foundry of Solar Aircraft Co., San Diego, Cal.

A new branch office to handle the sale of **Herman Nelson** products has been opened at 1660 Gilpin St., Denver, Colorado. The office will cover the Colorado and Wyoming district.

American Brake Shoe Company has published a new eight-page booklet describing **ABSCO** metal castings for industry. The folder describes characteristics of the material, lists properties, and carries engineering information on hardenability, section strength, and comparative properties of other cast metals.

Frank G. Hough Co., Libertyville, Ill., manufacturers of "Payloader" tractor-shovels and tractors, has appointed resident factory service representatives in five cities to establish closer contact with the service departments of its distributors in surrounding territories.

Appointment of representatives to handle the **Ohio Tramrail System**'s line in the Buffalo, Pittsburgh, and Peoria areas was announced by the Forker Corporation, Cleveland. The new representatives will enable the Cleveland manufacturer to give prompt service in engineering, installation and servicing. Matco Products Co., Buffalo, will represent the Tramrail line in Western New York State. Coverage of the Pittsburgh territory will be handled by the W. R. Lloyd Co., Pittsburgh, and the M. H. Equipment, Inc., will represent the line in the Peoria territory.

Sedger Fire Brick and Supply Co. has streamlined its sales operation. Now that the change-over is complete they are opening as A. P. Green Fire Brick Company of Wisconsin, Inc.

Rockwell Manufacturing Co. was one of 15 Pittsburgh firms to win top national honors for excellent management from the American Institute of Management this year.

Keeping pace with the dynamic growth of aluminum in industry, **Federated Metals Div.**, American Smelting and Refining Co., New York, has established a national Aluminum Department. Allan Nichamin will manage the new Aluminum Department. His office will be located in Detroit.

Donald L. LaVelle has been appointed assistant manager of the Aluminum Department. Mr. LaVelle's office will be located at the company's Perth Amboy, N. J., plant.

Armour Research Foundation of Illinois Institute of Technology has published their annual report for 1954 entitled "Blueprint for Progress."

Midwest Foundry Sand and Materials Co., Inc., has moved to 10415 West Michigan St. P. O. Box 291, Wauwatosa, Wis.

St. Catharines Brass Works Ltd. has opened a new foundry at 16 Smith St., St. Catharines, Ontario, Canada.

Building construction for the extensive expansion of **Harvey Aluminum**'s Torrance facility has reached the half-way mark. Huge extrusion and forging presses, to be operated in conjunction with the U. S. Air Force Heavy Press Program, plus additional foundry, mill, and research and development equipment for Harvey's aluminum division, will be installed in the new structures. Production from the added facilities is scheduled for mid year.

American Chain & Cable Co., Inc. of Bridgeport, Conn., whose Campbell Machine Div. is the leading manufacturer of abrasive cutting machines, is now able to offer more complete service to the metalworking industry. Its officials have announced the purchase of the Allison Company of Bridgeport, Conn., which has specialized for 35 years in the manufacture of abrasive cutting wheels.

National Cylinder Gas Co., Chicago, hon-

ored 96 employees who have served the company for 25 or more years at dinners held in eight different cities. Gold wrist watches were presented, as well as framed certificates of membership in the NCG 25-Year Club.

Frank G. Hough Co., Libertyville, Ill., has recently published a 60-page, 4-color booklet entitled "ABC Guide Book." The booklet was designed for improving industrial relations and lists in alphabetical order such topics as: advisory committee, canteen service, counseling, employees' benefit fund, and holidays.

With the construction of a new extension to the foundry at **Manistee Iron Works**, Manistee, Mich., the overall expansion and modernization program for this plant, embarked upon over a year ago, nears completion. The new extension has added 2500 sq ft to the foundry facilities and houses new sand handling and casting cleaning equipment. It also provided space for the installation of one of the foundry industry's most modern and complete laboratories for controlling quality of both core and molding sand as well as metals being cast.

Application of vitreous enamel to aluminum castings has been announced by **Monarch Aluminum Mfg. Co.**, Cleveland 2, Ohio. This achievement now adds dramatic color appeal and durable surface protection to the inherent advantages of aluminum castings. It is expected that this development will expand the use of aluminum castings in every conceivable type of market.

R. Levin & Sons, Inc., Chicago, has been appointed a distributor of **Kaiser Aluminum & Chemical Sales, Inc.** complete line of standard alloy ingot.

R. K. Price Associates, Inc. has moved its offices to 624 Madison Avenue, New York 22, N. Y., Murray Hill 8-7687.



A. J. Stinebiser (left), superintendent of Robertshaw-Fulton Controls Company's Scottsdale, Pa., plant and Steve Hollis, union president, hold National Safety Council plaque won by the plant in a nationwide industrial safety contest. The Scottsdale plant was winner in Group C, Foundries Div. as one of 126 entrants with 12 months free of disabling or "lost time" accidents.

FOUNDRYMEN of the Southeast met February 17 and 18 at the Tutwiler Hotel, Birmingham, Ala., to attend the 23rd annual Southeastern Regional Foundry Conference. Sponsored by the Birmingham District and Tennessee Chapters and the University of Alabama Student Chapter of the American Foundrymen's Society, the two-day meeting was attended by some 450 foundrymen and 80 ladies. This year, for the first time, a ladies program was staged concurrently with the technical sessions.

Host for this year's Southeastern Regional was the Birmingham District Chapter headed by E. E. Pollard. Program chairman was the vice-chairman of the chapter, A. J. Fruchtl, U. S. Pipe & Foundry Co. Mrs. L. N. Shannon was in charge of the program for the ladies.

The conference opened the morning of Thursday, February 17, with William G. Reichert, Automatic Foundry Equip. Reichert, Inc., Newark, N. J., speaking on "New Molding Practices and Flask Design." Session chairman was Aubrey Garrison, T. H. Benner & Co., Birmingham.

A second morning session featured Wally E. George, George & Dix, Grand Rapids, Mich., in a talk entitled "Foundry Costs and their Meaning to Foundry Supervision." E. J. Warwick, Anderson Brass Works, Inc., was chairman. Mr. George outlined the development of cost accounting and showed that it is essential to profit planning. Only those who can come close to knowing costs in advance and who can include a planned profit in each sales price can do any real job of profit making, he said.

Emphasizing the role of supervision in controlling costs—referring particularly to foremen—George pointed out that cost standards can only be met regularly when supervisors are given regular and prompt information on actual costs. Two keys to lower costs, he stated, are mechanization and management. The speaker closed by pointing out that the foreman is the key man in cost control. He asked his listeners to recognize that the foreman of a department of 30 workers is really the manager of some \$300,000 in costs to the company.

At the luncheon, the mayor of Birmingham, James W. Morgan, welcomed the foundrymen to the city. Other speakers were Bruce L. Simpson, National Engineering Co., Chicago, national vice-president of AFS, and Wm. W. Maloney, AFS general manager. A. J. Fruchtl, U. S. Pipe & Foundry Co., presided.

Three technical sessions were held after lunch. At the first, W. H. Moore, Meehanite Metal Corp., New Rochelle, N. Y., spoke on "Non-Destructive Testing and Inspection." W. B. Greiser, Ross Meehan Foundries, was chairman.

Safety, hygiene, and air pollution control were discussed by two speakers at the second session of the afternoon. Session chairman was Biddle W. Worthington, McWane Cast Iron Pipe Co. Harry E. Gravlin, Claude B. Schneible Co., Detroit, talked on the benefits of dust collection and illustrated a number of applications of dust collecting equipment. He brought out such values as decreased

FRANK HARRELL AND JACK AUSTIN, U. S. PIPE & FOUNDRY CO.



Approximately 450 foundrymen and 80 ladies registered at the Southeastern Regional Foundry Conference, oldest continuous series of AFS regional meetings.

Southeastern Foundrymen

Hold 23rd Annual Meeting

worker fatigue, higher production, and lower accident rate in a dust and smoke-free atmosphere. A shop with good in-plant atmosphere is in a better competitive position in securing and holding workers, he declared.

Wm. N. Davis, AFS director of safety, hygiene, and air pollution control, outlined progress in the program he heads, referring to the availability of *CONTROL OF EMISSIONS FROM METAL MELTING OPERATIONS*, and the first two sections of *ENGINEERING MANUAL FOR CONTROL OF IN-PLANT ENVIRONMENT IN FOUNDRIES*.

Continuing his talk with a discussion of safety, Mr. Davis cited figures to show that foundries are constantly improving their safety records. Injuries are caused by human failures rather than machine failures, he said, and the only way to prevent this is through constant instruction of the employees by the supervisors. He gave an example of a supervisor in one of the local foundries who held a safety meeting when operations were interrupted for a few minutes while waiting for materials, rather than lose the opportunity to put across a safety message.

Palmer Derby, Lynchburg Foundry Co., Lynchburg, Va., presented a paper on shell molding at the final afternoon session. Presiding was J. A. Wickett, U. S. Pipe & Foundry Co. Mr. Derby outlined early experimental work at Lynchburg, including blown shell molds which were successfully made in the spring of 1952.

Blown cores, he said, had been made with cartridge-type, bench blowing machines, a coated sand, and a hot cast iron bore box.

Resins are evaluated, Derby stated, on the basis of tensile and permeability tests made in the laboratory, and on regular production runs. Primary variations in resins for production work have been toward slower curing resins for intricate patterns to obtain longer flow characteristics. One resin was found to give slightly better dimensional stability while pouring the mold, with correspondingly better casting results. Conventional sand mixing equipment and 10 to 15-minute mixing cycles are used in preparing the sand-resin mixes.

Regardless of the method of applying the sand mixture to the pattern, horizontal surfaces receive the greatest impact while vertical surfaces receive the least, Derby said, in explaining differences in mold surfaces. Most forceful or most rapid application is not the way of eliminating mold surface voids, he said, indicating that when they appear, rate of application should be reduced. Having found the proper rate, it should be reproduced mechanically, he declared.

Turbulence as the sand and resin descend on the pattern influences shell surface, the speaker reported, and recommended small vents in the box over the pattern as a way of releasing air displaced by the falling sand. Another factor in surface quality is pattern and oven



Banquet scene at Southeastern Regional Foundry Conference shows, left to right: Dr. Houston Cole, State Teachers College; Walker Reynolds, Alabama Pipe Co.; E. E. Pollard, chairman, Birmingham District Chapter of AFS; and Wm. W. Maloney, general manager of AFS.

temperature, he said indicating that his company preferred lower temperatures. These also affect casting dimensions favorably. He also outlined methods of assembling shells, shell back-up, gating (80 per cent yield with pop gating), and tolerances.

The day ended with a reception and buffet dinner at the Mountain Brook Country Club, the ladies joining the men after a luncheon and afternoon fashion show.

The morning of the second day was devoted to plant visits; 28 foundries and plants of foundry suppliers of the area were open to conference attendants.

B. Y. Cooper, U. S. Pipe & Foundry Co., led off the afternoon technical sessions with a talk on "Preventive Maintenance." Aaron S. Glidewell, Production Foundries Div., Jackson Industries, Inc., was chairman. Mr. Cooper outlined maintenance techniques designed to keep little costs from becoming big costs. He emphasized the value of constant vigilance and attention to equipment, pointing out the high cost of shut-down which includes not only equipment repair but loss of production.

"Mechanization and Material Handling" was presented by Lester B. Knight, Lester B. Knight & Associates, Inc., Chicago. Session chairman was Aubrey H. White, Stockham Valves & Fittings Inc. Efficient castings production requires solution of problems in materials handling, plus control, and it is important to achieve the minimum manual handling and the maximum production, the speaker indicated. He emphasized the importance of knowing costs so uneconomical operations can be improved, and so orders that can't be undertaken profitably, or for which a foundry is not equipped, will not be accepted.

Two simultaneous sessions concluded the technical meetings. Wesley J. Estes, U. S. Pipe & Foundry Co., presented a paper entitled "Maintaining Cupola Bed Height" at the ferrous session. Chairman

was Sam F. Carter, American Cast Iron Pipe Co. The speaker described experiments in determining cupola burn-out during long heats and in gradually increasing the size of the coke splits to maintain bed height. (Editor's Note: Entire paper appeared in the March issue of **AMERICAN FOUNDRYMAN**, pages 42-44.)

At the non-ferrous session, H. L. Smith, Federated Metals Div., American Smelting & Refining Co., Pittsburgh, Pa., was the speaker, with T. C. Dann of the same company as chairman.

Concluding the conference was the annual banquet with Dr. Houston Cole, State Teachers College, Jacksonville, Ala., as principal speaker. E. E. Pollard presided; Warren Whitney, National Cast Iron Pipe Div., James B. Clow & Sons, was toastmaster.

Dr. Houston reviewed man's discovery and utilization of power, pointing out how it has increased production of the individual 22 times over what it was in 1900. Every increase in inanimate power has brought a corresponding decrease in the value of manpower, he said. While some see no further value in the individual except as a part of a group or social unit, he warned that emphasis must still be placed on the individual, in which progress has always had its origin.

Committee members who planned and staged this year's Southeastern Regional Foundry Conference were: Program—A. J. Fruchtl, U. S. Pipe & Foundry Co., chairman; C. P. Caldwell, Caldwell Foundry & Machine Co.; L. H. Durdin, Dixie Bronze Co.; and E. A. Thomas, Thomas Foundries, Inc. John F. Drennan, Kerchner, Marshall & Co., was conference secretary-treasurer.

Entertainment—Henry Guthrie, DeBardleben Coal Corp., chairman; W. J. Estes, U. S. Pipe & Foundry Co.; James A. Minter, A. P. Green Fire Brick Co.; and E. M. Whelchel, American Cast Iron Pipe Co.

Registration—W. K. Bach, Foundry Service Co., chairman; W. L. Allan,

Southern Precision Pattern Works, Inc.; Herman Bohr, Jr., Robbins & Bohr; T. C. Caldwell, Caldwell Foundry & Machine Co.; Ray F. Frings, H. G. Moust Co.; E. C. Finch, American Cast Iron Pipe Co.; C. C. Salvage, National Cast Iron Pipe Div.; James B. Clow & Sons; and J. C. Vaught, McWane Cast Iron Pipe Co.

Plant Visitation—W. Harry Bailey, Alabama By-Products Corp., chairman; James V. Fairley, Alabama By-Products Corp.; G. Brant Shelburne, Republic Steel Corp.; and Jerry Hoffman, Alabama By-Products Corp.

Publicity—J. A. Wickett, U. S. Pipe & Foundry Co., chairman; W. Fred Hetzler, Eureka Foundry Co.; and Frank E. Harrell, U. S. Pipe & Foundry Co.

Greeters—W. Guy Bagley, Woodward Iron Co., chairman; D. C. Abbott, Hill & Griffith Co.; Carl Fischer, Fischer Supply Co.; Porter Warner, Jr., Porter Warner Industries, Inc.; Aubrey Garrison, T. H. Benner & Co.; C. B. Saunders, Tennessee Product & Chemical Corp.; and Jack Williams, U. S. Pipe & Foundry Co.

Ladies Program—Mrs. L. N. Shannon, chairman; Mrs. T. H. Benner and Mrs. B. W. Worthington, co-chairmen.

Ladies Registration and Attendance—Mrs. A. J. Fruchtl, chairman; Mrs. J. F. Drennan, Mrs. L. H. Durdin, Mrs. K. P. Eiford, Mrs. M. Hawkins, Mrs. L. G. Henry, Mrs. M. D. Neptune, Mrs. E. E. Pollard, Mrs. A. B. Schwarzkopf, Mrs. A. W. Vogtle, Mrs. R. N. Voigt, and Mrs. Porter Warner, Jr.

Corrosion Course

The Vancouver Section of the National Association of Corrosion Engineers is holding a Corrosion Short Course April 19-22, 1955. The Course, which will be under the auspices of the University of British Columbia, will be held on the University Campus.

Corrosion engineers, technologists and educators will address the Course. In addition, there will be panel discussions, general discussion groups and question periods.

Subjects covered by the Course will include the electrochemical and mechanical aspects of corrosion fundamentals, cathodic protection, coatings, water treatment, inhibitors and the importance of designing to prevent corrosion.

Specific materials of construction to be discussed will include stainless steels, copper-base alloys, nickel-base alloys and non-metallic materials such as plastics. Some sessions will lay particular stress on marine, pulpmill and boiler corrosion problems.

Attendance of the Course is open to anybody interested in corrosion. Accommodation and meals will be available on the campus at a nominal cost if they are required.

Further information, program details and registration forms may be obtained from Dr. Ian Berwick, secretary of the Vancouver Section of the National Association of Corrosion Engineers, at the British Columbia Research Council, University of B. C., Vancouver 8, B. C., Canada.

QUALITY
ECONOMY
UNIFORMITY

QUALITY
ECONOMY
UNIFORMITY

QUALITY
ECONOMY
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Test after test shows

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In test after test, Yellowstone Bentonite proved the best! Here are results of a report made by an independent research laboratory (name furnished on request). Yellowstone was tested and compared with three other commercial western bentonites. Common testing procedures were those recommended by the American Foundrymen's Society.

- ★ Yellowstone produced highest green strength.
- ★ Yellowstone produced highest green permeability under all conditions.
- ★ Yellowstone had the highest green toughness.
- ★ Yellowstone was the most durable of the western bentonites.
- ★ Yellowstone was above the average of the bentonites tested in dry compressive strength.
- ★ Yellowstone produced better surface finish than other bentonites.

For quality, maximum economy, and assured uniformity every time, ask your distributor for Yellowstone Foundry Bentonite. It's the best bentonite on the market.



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Tours Highlight International Congress Plans

THE 1955 International Foundry Congress will be held at the Dorchester Hotel, London, England, June 19-25. The program organized by the Institute of British Foundrymen includes technical sessions, plant visits, receptions, special entertainment for the ladies, and two post-Congress tours. Outline of the program and tours is as follows:

Sunday, June 19. Garden party for delegates and their ladies. Motor coaches will take guests from the Dorchester and back.

Monday, June 20. Morning and afternoon tours of London, including the Royal Mint. Annual general meeting of IBF as well as council and committee meetings.

Tuesday, June 21. Opening ceremony in the ballroom of the Dorchester. Presidential address by Dr. A. B. Everest, and Edward Williams Lecture, "Metals Perfect and Imperfect," by Dr. T. E. Allibone. Simultaneous technical sessions in the afternoon, with tours for the ladies.

In the evening there are two consecutive receptions, one by Her Majesty's Government at Lancaster House, a second at the Hall of the Fishmongers Company.

Wednesday, June 22. Technical sessions all day. Excursions for the ladies to Kent to see castles, mansions, and old world gardens. Informal dinner and entertainment for all in the evening at the Piccadilly Hotel.

Thursday, June 23. Devoted to plant visits with choice of foundries making steel, malleable, brass, aluminum, bells, stainless steels, die castings, gas and electric cookers, automotive castings, and a crucible works. Ladies may visit Hampton Court Palace, travelling by steamer, or may visit Whitefriars Glass Works and Harrow School and Gardens.

Evening is open except for official delegates attending the International Committee dinner.

Friday, June 24. Technical sessions in the morning, closing ceremony in the afternoon, and banquet and dancing in the evening. For the ladies, a fashion show and visit to a leather handbag factory have been arranged.

Saturday, June 25. Excursion to Blenheim Palace, luncheon, and tour of Oxford Colleges. Return to London in time for dinner and the theater.

Post-Congress Tours

Two week-long tours have been scheduled to start on Sunday, June 26. Tour No. 1 takes visitors through the Shakespeare country—Birmingham, the East Midlands to Manchester. Tour No. 2 covers Scotland, the North East Coast,



Thames River and the Houses of Parliament as they will look to some of the foundrymen and their ladies who attend the 1955 International Foundry Congress, June 19-25, in London.

and Sheffield. The tours are managed by Thomas Cook & Sons.

Tour No. 1. Sunday morning, June 26, by invitation of the Birmingham Branch of IBF, guests will entrain for Leamington, where motor coaches will take them through Warwick and its famous castle, to finish the day in Birmingham. On Monday, June 27, there is a choice of five plants to visit, with a visit to Cadbury's chocolate factory for the ladies. The day ends with a cocktail party and a dinner.

On Tuesday morning two more foundries can be visited, while the ladies visit Marshall & Snelgrove's fashion store. During the afternoon, guests depart for Nottingham where the East Midlands Branch of IBF will hold a reception in the evening. There is a choice of three plant visits on Wednesday, June 29, while the ladies go to Hardwick Hall. In the evening, the party goes by train to Manchester where the tour is in the hands of the Lancashire Branch.

On Thursday, there is a choice of two more foundries to inspect, while the ladies are invited to the Wedgwood Pottery Co. at Stoke. In the evening, the Lancashire Branch is staging a theater party. Two more foundries will be visited on Friday, the ladies going to the ancient city of Chester, including a river trip on the Dee. During the evening there is an informal dinner and entertainment. Next morning, back to London.

Tour No. 2. On Sunday, June 26, delegates go by train or plane to Glasgow

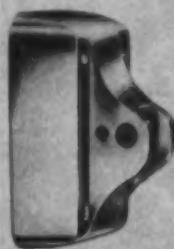
where arrangements have been made by the Scottish Branch of IBF. The following day, there is a choice of two plant visits in the morning, and two in the afternoon, with luncheon and tea at the companies visited. Ladies will tour the Three Lochs. The day will end with dinner at the Grosvenor Restaurant.

On Tuesday, June 28, there is a visit to a large steel foundry, while the ladies go by coach to Edinburgh, where they will be joined by the men early in the afternoon. After tea at the Waverley Hotel, the party entrains for Newcastle where arrangements are in the hands of the Newcastle Branch. Four plants are open to visitors on Wednesday, June 29, with an afternoon excursion for the ladies to Rothbury. All will join for dinner in the evening at the Royal Hotel, Hexham, in the heart of the countryside.

Thursday morning is taken up with a train journey to Sheffield, where, after luncheon, there is a plant visit. Dinner is at the Royal Victoria Hotel in the evening. The final day, Friday, July 1, two steel foundries will be visited, while the ladies visit Haddon Hall. Arrangements these last two days are by the Sheffield Branch. Friday evening the party will return to London.

Additional information can be secured, and arrangements for participating in this year's International Foundry Congress can be made, by writing to G. Lambert, Secretary, Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester 3, England.

Foundries and their customers agree...



BRONZE DOOR CASES—
"Machining and
polishing cut 50%"



STAINLESS-STEEL VALVE BODIES—
"High productivity—superior finish"



NICKEL-BRONZE DRAIN HEADS—
"Costly thread-cutting eliminated"



YOKES—
"Production time cut 56%
—finishing costs 50%"



PUMP BODIES—
"Machining reduced
or entirely eliminated"

SHELL MOLDING with G-E SHELL RESINS CUTS COSTS

Why are so many foundries turning to shell molding? Why are so many of their customers specifying shell-cast parts? The answer is simple: *Shell molding cuts costs*. Smoother surface finish, greater dimensional accuracy, and greater yield per man-hour are among its advantages over conventional sand-casting methods. (Note the brief testimonials—from G-E files—that tell the story!)

Ask G.E. about shell molding

General Electric offers a number of foundry products to help you get maximum benefits from shell molding: *G-E phenolic shell-molding resins* to form light, dimensionally accurate molds . . . *G-E silicone parting agents* to secure quick, easy release of molds from patterns . . . *G-E phenolic bonding resin* to cement shell halves together.

FREE BOOKLET AVAILABLE...

How can shell molding help YOU? General Electric, a major supplier of resins and release agents for the shell-molding process, has prepared an informative 28-page booklet telling about the techniques and benefits of this new foundry method. For a free copy of *G-E Shell Molding Manual*, just write to General Electric Company, Section 522-2B, Chemical Materials Department, Chemical and Metallurgical Division, Pittsfield, Massachusetts.



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MICHIGAN STATE COLLEGE . . Student chapter members are being shown a "tree" of plastic patterns in Precision Casting Dept., Mid-West Foundry Co., on a recent plant visit.

Chapter News

Chicago

Kickoff meeting of this year's educational course of the Chicago Chapter was a regular chapter meeting held March 7. Some 400 foundrymen turned out to hear Frank B. Rote and Bruce J. Allen, Albion Malleable Iron Co., Albion, Mich., describe their company's blow-squeeze molding installation. Technical chairman was Edwin J. Jory, Lester B. Knight & Associates, Inc.

Entitled "Molding Methods for 1955," the course features four meetings on successive Monday nights. Subjects announced by W. O. McFatridge, International Harvester Co., chairman of the Educational Committee, include, in addition to blow-squeeze molding, diaphragm molding, shell molding, and conventional molding methods.

The speaker at the first meeting described a fully integrated stack molding unit for casting pearlitic malleable rocker arms. Major components of the unit include sand conditioning and overhead prepared sand delivery, two blow-squeeze machines with automatic operation including stacking of mold sections, power conveyor, mechanized pouring, mechanical shakeout, semi-automatic grinding, continuous anneal, and automatic quench.

First attempts to use dry sand cores were dropped because too many core makers were required to keep up with the machines, and the core setters required put too many men in a limited area. All molds are now made entirely in green sand. (EDITOR'S NOTE: The installation is described in *AMERICAN FOUNDRYMAN*, May 1954, pages 144-146).

"Diaphragm Molding" brought over 270 foundrymen to the Peoples Gas Building to hear D. B. Shannon, Somerville Iron Works, Inc., Chattanooga, Tenn., speak of three years experience producing molds for cast iron pipe by this method. In describing the principle of diaphragm molding Mr. Shannon told that this method was the first (however unsuccessful) attempt at mechanical molding—prior to 1860.

Mr. Shannon said that an acceptable life for $\frac{1}{2}$ in. thick diaphragms used in his operation is 30,000 molds. They are replaced then regardless of condition, and have ready resale as shot blast liners. He did not see application of this molding method to very shallow flasks, but said the process is used on flasks two feet deep and for castings weighing as much as a ton (a jobbing operation). In fact, Shannon added, there are about ten jobbing applications to every production application. He told how diaphragm masking plates, adjustable stools and powered heads adapt the machine to variations in flasks.

Technical chairman of this second session of the Chicago Chapter Educational Series was Thomas E. Barlow, Eastern Clay Products Dept. of International Minerals & Chemical Corp., Chicago.

British Columbia

Warner B. Bishop, Archer-Daniels-Midland Co., was guest speaker at the February meeting and his subject was "Common Sense In Cores." Approximately 58 members and guests attended the meeting, to hear Mr. Bishop describe the results of various core sand mixtures as experienced in their experimental operations in Cleveland. —J. T. Hornby.

St. Louis

R. M. Serota, Coleman Dielectric Div., Foundry Equipment Co., Cleveland, was the guest speaker at the February Meeting. He discussed the fundamentals of dielectric heating and how it applies to the baking of a sand, water and resin core mix. Some of the advantages cited were: low baking temperature; rapid curing, uniform baking throughout; safety against overbaking; mechanization possibilities and reduced core handling. Some of the factors that require special consideration are variation in core size, plastic core dryers and the use of wire and rods.—Jack Bodine.

Twin City

"Aluminum Casting Defects and Their Correction," was the subject of D. L. LaVelle, Federated Metals Div., American Smelting & Refining Co., South Plainfield, N. J., at the February meeting. The meeting was attended by approximately 60 members and guests and was held at the Covered Wagon Restaurant, Minneapolis.

Mr. LaVelle pointed out the essentials of good foundry practice in each of the three phases of aluminum casting—melting, pouring and gating. In each area, the speaker defined the effects of poor practice in terms of the type of casting defect it causes.

Particular emphasis was placed on the pouring practice. Briefly, Mr. LaVelle's principle in defining good pouring practice was "keep the sprue full and the ladle down." Whatever means are necessary in refinements of either patterns or gating to accomplish this end, the speaker contended, are worth the effort. Mr. LaVelle strongly recommended rectangular shaped sprues and pointed out their distinct advantage in providing a smooth metal flow, thus avoiding the entrainment of air.

Carter DeLaittre, Minneapolis Electric Steel Castings Co., Minneapolis and Wayne Carlson, American Hoist & Derrick Co., St. Paul, Minn., reported to the group the relatively good safety record achieved by Twin City foundries. It was pointed out that of all the accidents reported a large majority of them occurred at the shakeout.—R. J. Mulligan.

Mo-Kan

The February meeting of the Mo-Kan Chapter was held at the Fairfax Airport, Kansas City, Kansas and was attended by 41 members and guests. Lloyd Canfield, chapter chairman, and E. C. Austin, National Aluminum & Brass Foundry Co., commented on the Missouri Valley Regional Conference, which is to be held October 20-21 at the Missouri School of Mines, Rolla, Mo.

Guest speaker at the meeting was J. D. Robinson Foundry Div., Bendix Aviation Corp. His subject was "Methods Used in Production of Aircraft Quality Aluminum and Magnesium Castings." —Howard Julian.

Northeastern Ohio

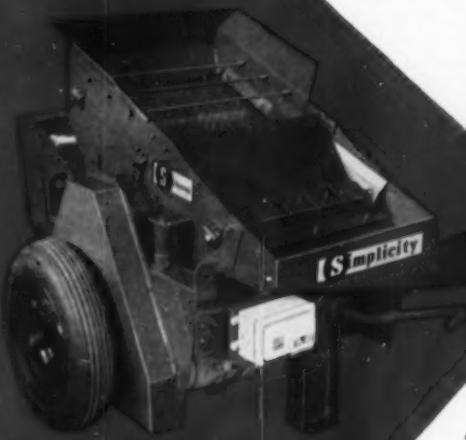
The chapter's Patternmaking Div. presented the February meeting at the Tudor Arms Hotel, Cleveland. G. A. Pealer,

**SIMPLICITY PORTABLE
SAND CONDITIONERS
INCREASE PRODUCTION
—LOWER COSTS**

See us at Booth 2032-2034 Materials Handling
Exposition, Chicago, May 16th to 20th.

**SCREEN, AERATE
AND FLUFF
IN ONE OPERATION**

A SIMPLICITY 4' x 4' Portable Sand Conditioner in operation at Brown Industries Foundry, Sandusky, Ohio. Note the front end loader which is also employed to move the unit.



The SIMPLICITY 2' x 3' Portable Sand Conditioner can handle 10 to 15 tons of molding sand per hour—all the sand two men can shovel. The two-wheel model pictured is equipped with pneumatic rubber tires 24 inches to diameter. It is especially designed for foundries with sandy or uneven floors. Three-wheel solid rubber tread models also available for foundries with hard or uneven floors. Screen sizes on other models range from 12% to 18% up to 4' x 6'—capacity from 2 to 50 tons per hour.

Foundries without a regular sand handling system can reduce sand handling costs, increase production, and improve the quality of their castings by installing SIMPLICITY Sand Conditioners. Designed for operation on side floors or main bays without sand systems, these compact, portable units screen out hard core butts, chills, gingers, nails and other pieces of metal and break down hard lumps and balls into finely screened useable sand, thereby eliminating sand waste. In the same operation, the sand is thoroughly aerated and fluffed, producing molding sand with a high degree of permeability. The result: good, clean castings that require less shake-out and finishing time; fewer rejects and less scrap. Experienced foundrymen report that the savings made possible through the use of a SIMPLICITY Sand Conditioner will more than pay for the unit in six months or less.

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AFS Chapter Chairmen



Arthur W. Johnson, assistant superintendent, Northern Malleable Iron Co., St. Paul, is the chairman of the Twin City Chapter of American Foundrymen's Society. After serving in the Navy during the 1st World War, he began his foundry career with Northern Malleable Iron in 1922 as a core department foreman. Later he advanced to a molding foreman and then to his present position of assistant superintendent. Active in the Twin City Chapter of AFS, Mr. Johnson has been a director, a vice chairman, and a program chairman.



David Clark, Jr., chairman of the Northeastern Ohio Chapter of American Foundrymen's Society, is plant manager of Forest City Foundries Co., Cleveland. Mr. Clark was born and educated in Scotland and joined Forest City Foundries upon his arrival in Cleveland in 1929. He is now serving as chairman of the operator's group of Gray Iron Research Institute, Columbus, Ohio. Mr. Clark has been a vice-chairman, a program chairman, and a membership chairman of the Northeastern Ohio Chapter of AFS.

General Electric Co., Elmira, N. Y., spoke on the pattern engineers' function in producing better castings at a lower cost.

After pointing out that all production is possible only because of castings and tracing the early development of metals and the foundry industry, Mr. Pealer told how patternmaking became recognized as a separate craft in the middle of the last century. Since that time the pattern engineer has come into being. A pattern engineer is defined as one who has served in the core room, the foundry and the machine shop, has learned the patternmaking trade and who, in addition, is progressive and deeply interested in the foundry's welfare.

Proper procedure in quoting on pattern equipment is to check the design to see if any changes could be made that would improve the casting or would eliminate a core or a loose piece in order to reduce the selling price of the casting. Too often design engineers do not know foundry procedure or the action of metal in cooling. Numerous cost studies show the advantages to be gained in engineering the casting and the pattern for the job they are to perform.—*Byron E. Kennel*.

Corn Belt

J. D. Robinson, Bendix Products Div., Bendix Aviation Corp., was guest speaker at the February meeting held at the Rome Hotel. J. M. Bucholz, Dempster Mill Mfg. Co., presided. Mr. Robinson spoke on "Foundry Experiences in Aircraft Aluminum and Magnesium." He also presented slides showing types of castings and their problems in aircraft work.

Portions of the talk were devoted to testing, melting and heat treating. Mr. Robinson also discussed the sand cast and permanent mold practice used in aluminum and magnesium. — *Eugene Hagedorn*.

Central New York

The Past Chairmen's Club of the Central New York Chapter have contributed to a fund to purchase a set of the American Foundrymen's Society Technical Library books and present it to the Engineering College, Syracuse University. Any member that has Transactions or other books he would care to donate to this project will be helping a worthy cause.

Ohio State

The March meeting of the Ohio State University Student Chapter was held in the Industrial Engineering Building, Ohio State University Campus. Guests attending the meeting were: Paul Eubanks, industrial advisor, Ohio Steel Co., Springfield, Ohio; and guest speaker for the evening Bert Claeboe, North American Aviation Corp., Columbus, Ohio. Mr. Claeboe spoke on "Patent Problems for Engineers."

It was announced by George Greenwood, chapter president, that General Motors Corp. would defray the hotel bill for all students attending the annual Foundry Educational Foundation convention in Cleveland, March 7-12.

The February meeting of the student

AFS Chapter Chairmen



Fred E. Kurtz, chairman of the Central Indiana Chapter of AFS, is foundry molding supervisor of Electric Steel Castings Co., Indianapolis. After studying chemical engineering at the University of Cincinnati, he began his foundry career in the furnace room of Lunkenheimer Valve Co., Cincinnati. After four months he became a metallurgist with Electric Steel Castings Co., and then in 1953 he was made molding supervisor. Mr. Kurtz has been a vice-chairman, secretary, and director of the Central Indiana Chapter of AFS.



Alfred S. Morgan, chairman of the Canton District Chapter, is assistant foreman of the Iron Foundry, Babcock & Wilcox Co., Boiler, Div., Barberton Works, Barberton, Ohio. Mr. Morgan began his foundry career at New Jersey Zinc Co., Paterson, Pa. He was later employed by the Fuller Lehigh Plant of Babcock & Wilcox, and upon their closing was transferred to the Barberton Plant where, except for a ten-year period in production and time study work, he has been associated with foundry work. He was chapter vice-chairman.

What you can expect

from "SW"
Cupola Collector
operation!

TESTS ON "SW" CUPOLA COLLECTOR OPERATION*

OPERATING PERIOD

CUPOLA OPERATING DATA	
Cupola Size.....	#8 Whiting
Shell Dia. at Melt Zone.....	78 inches
Shell Dia. at Top.....	78 inches
I. D. Lining—Melt Zone.....	53 inches
Average Daily Melt.....	7 hours—50 tons
Average Melt Rate.....	7.5 tons/hr.
Iron—Coke Ratio.....	7 to 1
Blast Air.....	3,200—4,750 CFM
Area of Charging Door.....	50 square feet

TEST NO.	DURATION	AIR BLAST	EFFLUENT DUST CONCENTRATION
1	40 Minutes	3,600 CFM	0.42# per 1,000# Exhaust
2	40 Minutes	4,500 CFM	0.33# per 1,000# Exhaust
3	30 Minutes	3,500 CFM	0.43# per 1,000# Exhaust
5	31 Minutes	3,800 CFM	0.40# per 1,000# Exhaust
6	30 Minutes	4,500 CFM	0.56# per 1,000# Exhaust
8	13 Minutes	3,900 CFM	0.39# per 1,000# Exhaust
9	30 Minutes	—	0.41# per 1,000# Exhaust
10	30 Minutes	3,500 CFM	0.48# per 1,000# Exhaust
Av. 0.43# per 1,000# Exhaust			

RUN DOWN PERIOD

*Location of test installation on request.

4	30 Minutes	4,750 CFM	0.66# per 1,000# Exhaust
7	32 Minutes	—	0.72# per 1,000# Exhaust

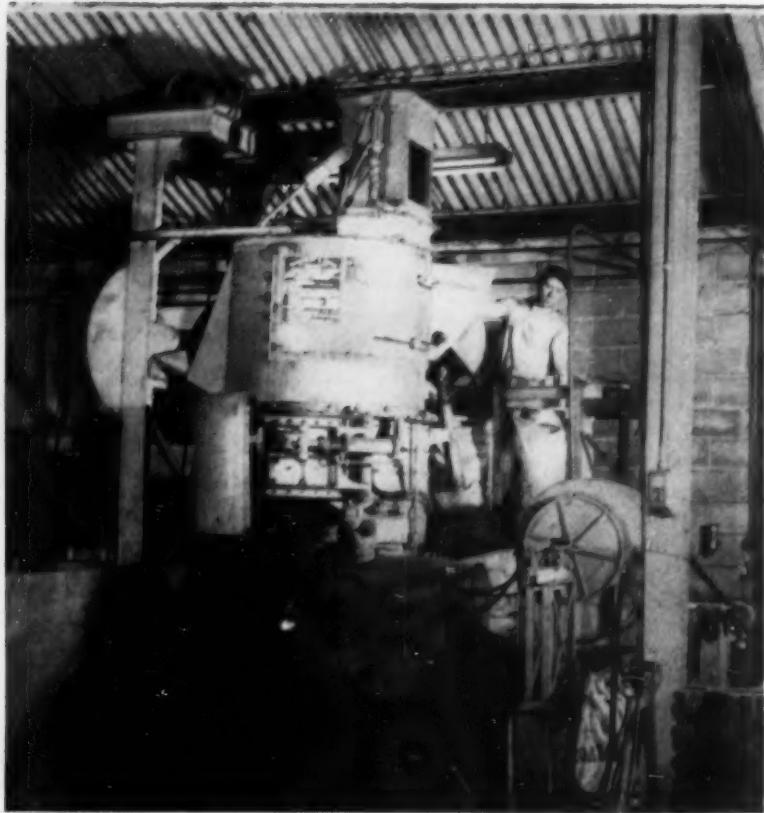


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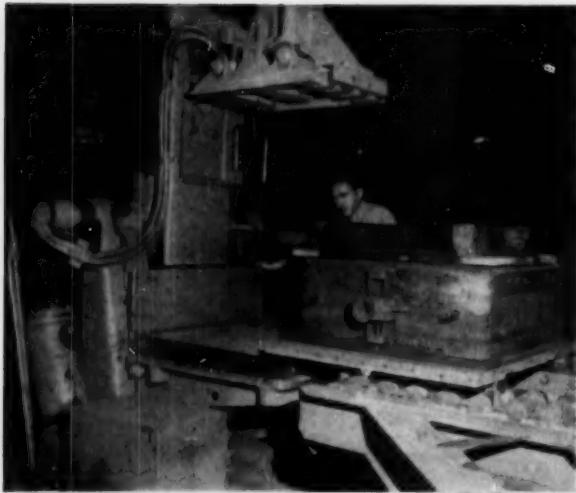
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SCHNEIBLE

Modern Installations CUT COSTS at these Foundries!



\$60.00 A DAY is saved with this new Model "40-60" Speedmullor-Preparator Unit at the nine-molder Kelly Foundry & Machine Company, Elkins, West Virginia. With this low-cost unit, one man handles all the shakeout sand, delivers it to the Preparator, thoroughly conditions and mulls it in the unit, and returns the milled sand to the molding floors. In addition to direct labor savings in the foundry, cleaning room costs are lower, casting losses are reduced, and the foundry has the advantage of better castings and a controlled operation. The unit is paying for itself in less than a year. For full data write to Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill.

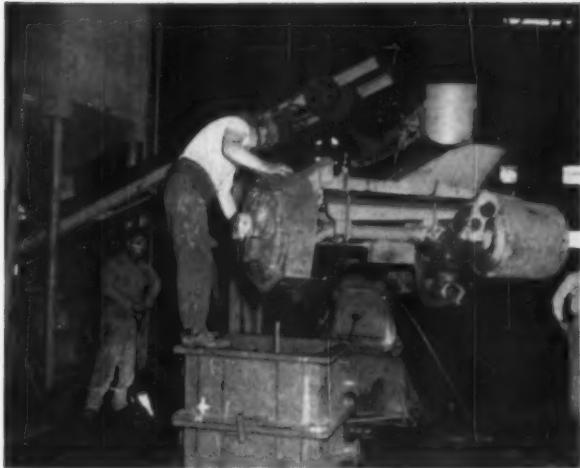


AN AUTOMATIC FLASK EQUALIZER and clamp and draw arrangement allows fast clamping of molds of various heights and automatically compensates for mold height irregularities on this J&J 920 Rol-A-Draw at Service Foundry of New Orleans. The Rol-A-Draw is part of a fast Slinger-Rotomold Unit that handles the foundry's jobbing work on a production basis. For the full story of Service Foundry write to Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill.

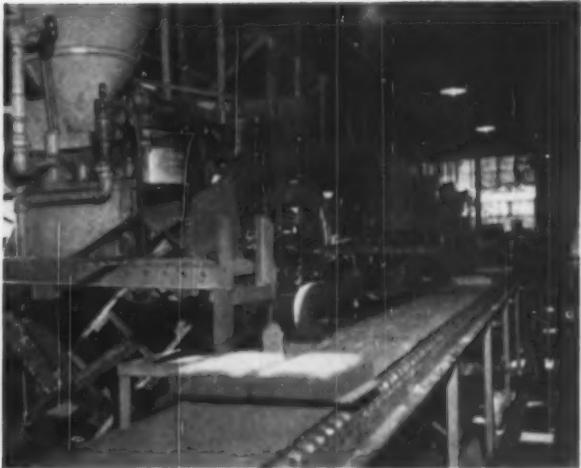


ONE MAN operating two Model "60" Speedmullors mulls over 500 tons of all-purpose synthetic molding sand daily for the high production molding operation at the Lufkin Foundry & Machine Company of Lufkin, Texas. One minute mulling cycles are ample to obtain the high sand physical properties required to meet Lufkin's exacting specifications. For full information write to Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill.

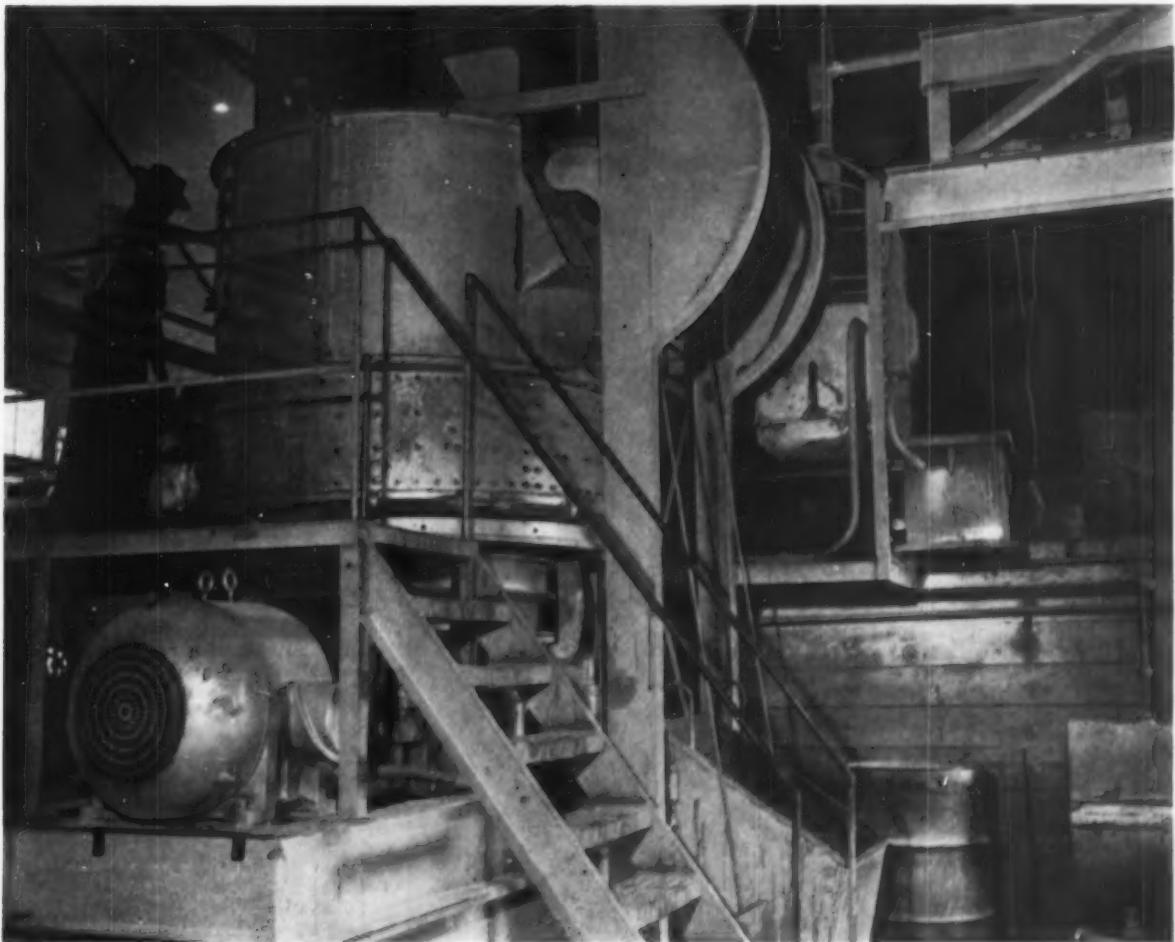
For more facts, circle No. 156 on postage-free Reader Service card on p. 17 or 18



DIBERT, BANCROFT & ROSS CO., LTD. of New Orleans, one of the leading steel foundries of the South, uses a Stationary Sand-slinger to ram a wide variety of jobbing work. This slinger with raising and lowering arms easily handles molds of various heights. The work is greatly speeded and molds are rammed truer-to-pattern than by other molding methods. Full information may be obtained by writing to Beardsley & Piper, 2424 No. Cicero Ave., Chicago 39, Ill.



FOUR CHAMPION CORE BLOWERS in the core room of Texas Foundries, Inc., at Lufkin, Texas are doing a real job. There, in the largest Malleable Foundry in the South, Champion Flexiblows have proved valuable because of their outstanding ability to handle a wide range of different jobs and all types of core boxes . . . vertically-split, horizontally-split or open-face. For the latest information write to Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill.



A MODEL "60" SPEEDMULLOR at the Texas Foundries, Lufkin, Texas, mulls the oil bonded core sand for this malleable foundry's modern core room. The sand is thoroughly milled to exacting speci-

fications in one-and-a-half minute total milling cycles. Loading is conveniently accomplished by Speedmullor Skiphoist. Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill. will provide full data.



EASTERN NEW YORK . . Panel members at the February meeting, left to right: J. Keverian, J. Wheeler (who substituted for Leo Scully), Howard B. Nye and Ambrose Marchand.



WESTERN MICHIGAN . . Speakers table at the February meeting, from left to right: R. Flora, Clever Foundry Div., Hastings Mfg. Co., technical chairman; Dr. F. B. Rose, Albion Malleable Iron Co., guest speaker, and A. Demler, Campbell Wyant & Cannon Foundry Co.

KEN SHECKLER, CALMO ENGINEERING CO.



SOUTHERN CALIFORNIA . . Attending the February meeting, from left to right: G. Emmett, L. A. Steel Casting Co.; J. Myers, Snyder Foundry Supply Co.; T. Tuzzolino, Overton Foundry; W. B. Bishop, Foundry Products Div., Archer-Daniels-Midland Co., and guest speaker; W. Baud, Mechanical Foundries Div., Food Machinery Corp.; and C. Gregg, Gregg Iron Foundry.



TRI-STATE . . Speakers table at the February meeting, from left to right: R. F. Forsythe, Big Four Foundry, Tulsa; R. W. Trimble, Bethlehem Supply Co., Tulsa; D. A. Johnson, Bendix Aircraft Corp., South Bend, Ind.; Willis Mock, Bethlehem Supply Co., Tulsa; E. W. O'Brien and W. C. Heckbarth, both of Oklahoma Steel Castings Co., Inc.

chapter was held in conjunction with the regular February meeting of the Central Ohio Chapter.

Timberline

Approximately 38 members and guests attended the February meeting of the chapter at the Oxford Hotel, Denver, Colo., to hear J. D. Robinson, Bendix Product Div., Bendix Aviation Corp., speak on "Magnesium and other Non-Ferrous Metals." Byron McPherson, McPherson Corp., presided and Bill Manke, American Manganese Steel Div., was technical chairman.—A. D. Neal.

Oregon

Warner B. Bishop, Foundry Products Div., Archer-Daniels-Midland Co., was guest speaker at the February meeting of the Oregon Chapter and his subject was the "D Process."

Mr. Bishop described the D process briefly and then went into a more detailed description using slides to illustrate the procedure used in making the shells. The D process differs from the C process in that the D process uses a cold pattern to form the shell. The sand-D process oil mixture may be either blown or hand-rammed and the shells are then baked for about 30 minutes.

He compared the C process, the D process and green sand molding and gave advantages and disadvantages of each method. He stated that each method may be more suitable for certain applications, and the one used depends upon which method will produce the best casting economically.

It was announced at the January meeting that the Portland Public Library had accepted the complete publications of the American Foundrymen's Society as a gift from the Oregon Chapter. James T. Dorgan, Electric Steel Foundry, was named chairman of the Northwest Regional Conference to be held in Portland in October, 1955.—Tony Belusko.

Michigan State College

Twenty-five members of the M. S. C. Student Chapter made a plant visitation trip to the Mid-West Foundry Co., Coldwater, Mich., February 8, 1955. High-light of the trip was the tour of the precision investment department where high alloy content castings were being made by the "lost wax" process.

Arrangements for the trip were made by John Wolf, plant manager, and R. Bannister, manager of the Precision Casting Div.—Prof. C. C. Sigerfoos.

Tri-State

February 18 was National Director's Night for the Tri-State Chapter. Fifty-five members and guests attended the dinner meeting at the Alvin Hotel, Tulsa, Okla., in honor of R. W. Trimble, Bethlehem Supply Co., Tulsa. Mr. Trimble was recently nominated to serve as National Director of AFS for a three-year term. He was one of the organizers of the chapter, the first chapter chairman, and chairman of the membership committee.

D. A. Johnson, Bendix Aircraft Corp., was guest speaker at the meeting and his

subject was, "Aluminum and Magnesium Foundry Practice in Relation to Aircraft Industry."—A. M. Fisher.

Saginaw Valley

Approximately 275 members and guests and their ladies attended the February "Ladies Night" meeting held at the Fischer's Hotel, Frankenmuth, Mich.

Dr. Llewellyn Heard, Standard Oil Co., was guest speaker and his subject was "Fire Magic." His interesting comments and demonstrations of fire thrilled all attending. He punctuated his talk with smoke rings, green flames, and minor explosions, and described the many experiments in a manner readily understood by all.—Nicholas Sheptak.

Western Michigan

Dr. Frank B. Rote, Albion Malleable Iron Co., was guest speaker at the February meeting, held at Bill Sterns, Muskegon, Mich., and his subject was "Stack Molding." Approximately 130 members and guests attended the meeting.

Dr. Rote pointed out that blow-squeeze stack molding requires the understanding of new concepts of integration of molding, stacking, pattern equipment and sand for mass production of green sand castings having irregular parting. He described the principles and operation of each unit of the mechanical equipment. Explanation of sand requirements and description of sand control followed. Examples of stack molded rocker arms and a color movie showing, in part, the operation of the line were also presented.—Wilson W. Hicks.

Michiana

The February meeting was held in the Oliver Hotel, South Bend, Ind., with 90 members attending. Vice-chairman Fred Davis introduced the speakers for this split meeting.

T. E. Barlow, Eastern Clay Products Dept., International Minerals and Chemical Corp., Chicago, presented a talk on "High Pressure Molding" to the ferrous group. This process, he said, is one in which molding pressure, sand flowability, and mold shape are regulated to produce green sand mold density capable of reproducing pattern dimensions with extreme accuracy and uniformity. Mold hardness is not completely related to precision molds and castings, while mold density is related directly to finish and tolerance.

In the Blue Room, Harry St. John, Crane Co., Chicago, spoke to the non-ferrous group and his subject was "Brass and Bronze Foundry Practice." He said fracture method is still the best check on quality castings. Automation and its difficulties were also discussed.—F. Crowley.

Quad City

The February meeting was held at Hotel Fort Armstrong, Rock Island, Ill., with 60 members and guests attending. After announcements by chairman W. Ellison, Theim Products, members present unanimously accepted the new By-Laws.

E. VanVooren, John Deere Malleable Iron Works, technical chairman for the evening, introduced the speaker, J. S.



MEXICO CITY . . Members attending a Mexican barbecue dinner at the Bay Horse restaurant, at the February meeting of the chapter.



NORTHWESTERN PENNSYLVANIA . . Talking things over at the February meeting, from left to right: Bailey D. Herrington, Hickman, Williams & Co., chapter chairman; R. C. Strong, Griswold Mfg. Co., treasurer; W. E. Sicha, Aluminum Co. of America, speaker; R. L. Johnson, Bucyrus-Erie Co., secretary, and Jacob Diemer, Erie Casting Co., program chairman.



WASHINGTON . . Apprentices viewing contest entries at the February meeting, from left to right: Dan Franks and Albert Meier, both of Atlas Foundry and Machine Co., and Herb Nelson, Pacific Pattern Co.



NORTHERN CALIFORNIA . . Photographed at the February meeting held at the Hotel Shattuck, Berkeley, Cal., from left to right: Harold Henderson, H. C. Macaulay Foundry Co., chapter educational chairman; W. B. Bishop, Foundry Products Div., Archer-Daniels-Midland Co., guest speaker; and C. R. Tinsley, U. S. Pipe & Foundry Co., chapter finance chairman.

FRED RIDENOUR, WHITING CORP.



CHICAGO . . Group enjoying themselves at the Annual Ladies Night held February 12, at the Morrison Hotel, Chicago.



CENTRAL ILLINOIS . . T. E. Barlow (center) who spoke on "High Pressure Molding" at the February meeting, discussing the subject with J. Shellabarger (left) technical chairman, and L. Hieden (right) program chairman.

Schumacher, Hill & Griffith Co., who spoke on "Fool-Proof Sand." The speaker opened his talk by noting that 150 shops are using sand of this description. The sands had to produce low scrap, good finish and casting accuracy, be easy to ram and control and be capable of producing various sized castings in different metals. To meet these requirements, Mr. Schumacher recommended the use of a four screen sand, Southern Bentonite, Sea Coal and a cellulose. The physical properties that might be expected from this mix along with alterations necessary for different casting sizes were then described. —*Grant F. Thomas*.

Northwestern Pennsylvania

The February meeting was held at the Erie Moose Club, Erie, Pa., and was attended by one of the largest congregations of the season.

W. E. Sicha, Aluminum Co. of America, spoke on "Aluminum Foundry Practice." Although the theme followed was aluminum and its defects, causes and corrections, much of the discussion had to do with foundry practices in general. —*R. A. Loder*.

Mexico City

At the January meeting plans for starting Foundry-Foremen Training Classes were inaugurated. February 21, classes for foundry foremen were inaugurated at the School of Engineers known as Escuela Superior de Ingenieros Mecanicos Electricistas, with the cooperation of Augusto Perez Bouras, director of the school. Courses were started with approximately 20 students, and the courses will be carried out with the cooperation of several foundries and one supply house in Mexico City, who are contributing a fixed amount each month.

Any obsolete equipment for sand testing, molding, sand blasting, etc., could be used in the courses and would be appreciated. An offer of the equipment should be sent to N. S. Covacevich, Chairman, Chapter 32, Apartado 1030, Mexico, D. F.—*N. S. Covacevich*.

Eastern New York

A panel discussion on casting defects attracted more than 50 members and guests to the February meeting held at Panetta's Restaurant, Menardes, N. Y.

Members of the panel included Jack Deverian, General Electric Research Laboratory, Jasper Wheeler, Wheeler Bros. Brass Foundry; Howard B. Nye, Crompton Knowles Loom Works, and Ambrose Marchand, Adirondack Foundries & Steel Co.

Several scrap castings were brought to the meeting by local foundrymen for inspection and comment by the panel. —*L. J. DiNuzzo*.

Washington

Approximately 58 members and guests attended the February meeting at the Stewart Hotel, Seattle, to hear Warner B. Bishop, Archer-Daniels-Midland Co., speak on "Common Sense in Cores."

Previous to the technical meeting, the local Apprentice Contest judging was



CENTRAL MICHIGAN . . Talking things over of the February meeting, from left to right: Dr. F. B. Rote, Albion Malleable Iron Co.; L. Currie, Gale Mfg. Co., and chapter chairman; Prof. C. C. Sigerfoos, Michigan State College, and Dr. R. Schneidewind, University of Michigan, guest speaker.

done with all 16 entries present. First place prize winners in each division were: Dave Sullivan, Pacific Car & Foundry Co., Patternmaking; Wayne E. Myrick, Puget Sound Naval Shipyard, Steel; Naaman B. Peterson, Puget Sound Naval Shipyard, Non-Ferrous, and William Knapp, Sumner Iron Works, Iron.

The regular meeting was started with chairman Jim Wessel announcing the Nominating Committee's nominations for officers next year. Mr. Wessel then introduced William Pindell, AFS National Director, who spoke on the assistance available from either him or the National Office on any problems that might occur.

Mr. Bishop started the object of our cores was to make a controlled dimension hole in a casting as cheaply as possible. He presented four factors which he felt were not difficult to control and which could decrease the cost in core rooms from 10 to 50 per cent. These factors are: (1) Measurement of materials, (2) Mixture of materials, (3) Controlled moisture, and (4) Proper baking. Mr. Bishop showed many slides and tables to illustrate part of his talk.—William K. Gibb.

Central Michigan

Lachlin Currie, Gale Mfg. Co., chapter chairman, presided at the February meeting held at the Hart Hotel, Battle Creek, Mich.

Dr. Richard Schneidewind, University of Michigan, guest speaker, was introduced by Fitz Coughlin, Dock Foundry Co. Dr. Schneidewind spoke on the "Injection Process" and told how it can be used in molten iron. He has proven through research and practical application that many desired physical properties can economically be obtained using this procedure.—Lewis Heisler.

Southern California

The February meeting was held at the Rodger Young Auditorium, Los Angeles, where 107 members and guests were in attendance.

Warner B. Bishop, Foundry Products Div., Archer-Daniels-Midland Co., Cleveland, was guest speaker and his subject was "Common Sense In Cores."

Mr. Bishop stated that "the cheapest core is the best one" and that there were

four primary factors which, if followed, would save costs in the core room. These factors are: (1) Measurement of mix by weight rather than volume, (2) Proper mixture by having the proper amount of ingredients added in the proper sequence, (3) Correct moisture content, and (4) Proper baking cycle. The speaker stated that speeding up the baking cycle on cores is detrimental, as it tends to reduce the value of the cereal binders by as much as 50 per cent.—W. G. Stenberg.

Central Illinois

T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, was guest speaker at the February meeting and his subject was "High Pressure Molding." John Shella-barger, who served as technical chairman, introduced Mr. Barlow.

The speaker explained the development of high pressure molding during the past 10 years. Cited the advantages of this process, such as uniformity of ramming, minimum pattern wear and great dimensional accuracy of castings produced. A further explanation was made of the machine used and the adaptability of present pattern equipment to this type of molding.—C. Turner.

Other Organizations Connecticut Non-Ferrous Assn.

R. J. Hesenerger, PneuBin Div., Gerotor May Corp., Baltimore, Md., was guest speaker at the February meeting of the Connecticut Non-Ferrous Foundrymen's Association held at the Quinnipiac Club, New Haven, Conn.

Mr. Hesenerger discussed a unit defined as steel-backed, neoprene, pulsating panels mounted on the inside wall of bins, and air controls to regulate the panel's action. By pneumatic inflation and deflation of the units' panels, the bin contents are positively displaced to insure free flow. After the panels have deflated, the air control unit (operating off the regular plant air supply) starts another cycle of inflation and deflation. The process continues automatically at whatever frequency is set on the air controller (this frequency is adjustable).

Material flow in general was discussed, with reference made to work on flow of solids from hoppers by A. W. Jenike and J. K. Rudd. A review of the sand cycle in the foundry was discussed as the major problem in foundry bulk material handling.—Frank B. Diana.

Reading Foundrymen's Association

Three separate conferences were held at the February meeting of the Reading Foundrymen's Association held in the Berkshire Hotel.

Dr. J. P. Brull, North American Smelting Co., Wilmington, Del. addressed the Brass and Bronze foundrymen. W. S. Flinchbaugh, York Corp., York, Pa., addressed the Grey Iron Foundrymen, and Edward H. Berry, Dodge Steel Co., Philadelphia, Pa., addressed the Steel foundrymen.

President James Woodward presided at the dinner and business meeting which preceded the technical conferences.—W. J. Cassidy.

Chapter Meetings

April

4 . . Central Indiana

Athenaeum, Indianapolis. J. S. Schumacher, Hill & Griffith Co., "Pressure Molding."

4 . . Metropolitan

Essex House, Newark, N. J. H. F. Bishop, Naval Research Laboratory, "Feeding Castings."

4 . . Central Illinois

American Legion Hall, Peoria. Clyde A. Sanders, vice-president, American Colloid Co., "Effect of Molding Materials on Apparent Metal Shrinkage."

4 . . Chicago

Chicago Bar Association, Chicago. Malleable & Gray Iron Div.: Lyle Jenkins, Wagner Malleable, "Production and Characteristics of Pearlitic Malleable and Ductile Irons"; Steel and Maintenance Div.: Samuel Arnold III, consultant, "Electric Furnace Operation and Maintenance"; Non-Ferrous Div.: George W. Anselman, consultant, "Natural or Synthetic Sands"; Pattern Div.: Carl J. Johnson, Western Foundry Div., Consolidated Foundries, Inc., "Patterns for the Atomic Age."

4 . . Cincinnati District

Cincinnati Club, Cincinnati. National Officer's Night. J. B. Caine, consultant, "Gates and Risers."

4 . . Western Michigan

Cottage Inn, Muskegon, Mich.

5 . . Rochester

Hotel Seneca, Rochester. T. E. Barlow, sales manager, Eastern Clay Products Div., International Minerals & Chemical Corp., "High Pressure Molding."

5 . . Rochester

Seneca Hotel, Rochester, N. Y. T. E. Barlow, sales manager, Eastern Clay Products Dept., International Minerals and Chemical Corp., Chicago, "High Pressure Molding."

6 . . Toledo

Toledo Yacht Club, Toledo. F. S. Brewster, vice-president, H. W. Dietert Co., Detroit, "D Process."

7 . . Canton District

Mergus Restaurant, Canton, Ohio. Douglas James, Cooper Bessemer Corp., Grove City, Pa., "Nodular Iron."

7 . . Saginaw Valley

Fischer's Hotel, Frankenmuth, Mich. Iron: D. E. Matthieu, Alabama Pipe Co., Anniston, Ala.; Steel: Warren Lewis, Great Lakes Foundry Sand Co., Detroit; Light Metals: Arthur Greene, Allison Div., General Motors Corp.

8 . . Philadelphia

Engineers Club, Philadelphia. Charles Mooney, Jr., Olney Foundry, Link-Belt Co., Philadelphia, "Guide to Core Mixtures."

11 . . Michigan

Elkhart Hotel, Elkhart, Ind. Entertain-
continued on page 94

E. H. MOSSNER



SAGINAW VALLEY . . Dr. Llewellyn Heard, Standard Oil Co., performed many experiments in discussing "Fire Magic" before the Ladies Night Meeting February 3.

Chapter Meetings

continued from page 93

ment Meeting. Plant visitations, film, and entertainment.

11 . . Central Ohio

Seneca Hotel, Columbus, Ohio. H. F. Bishop, head, Casting Section, Naval Research Laboratory, "Gating and Riser-ering."

11 . . Timberline

Oxford Hotel, Denver. Regional Officer Night. J. O. Klein, "Steel Casting."

12 . . Northern Illinois-Southern Wisconsin

Lafayette Hotel, Rockford, Ill. Clyde A. Sanders, vice-president, American Colloid Co., "Have You Seen These Defects."

12 . . Twin City

Covered Wagon, Minneapolis. Panel discussion, "Practical Quality Control." Moderator: Nathan Levinsohn, foundry superintendent, Minneapolis Moline Co. Panel: Ralph Brown, chief inspector, Minneapolis Moline Co.; Frank Berchem, assistant superintendent in charge of Cleaning and Finishing Dept., Northern Malleable Iron Co.; John Uppgren, foundry superintendent, Northern Ordnance, Inc.; and H. H. Blosjo, metallurgist, Minneapolis Electric Steel Castings Co.

13 . . Ontario

Royal York Hotel, Toronto, Ladies' Night.

14 . . Northeastern Ohio

Tudor Arms Hotel, Cleveland. National Officers and Apprentice Night. Movie: "Man with 1,000 Hands."

15 . . Tennessee

Patten Hotel, Chattanooga. George A. Riley, American Brake Shoe Co., "Safety in the Foundry."

15 . . Southern California

Roger Young Auditorium, Los Angeles. George E. Miller, sales manager, Machine Div., Federated Foundry Supply Co., Cleveland, "Sand Ramming by Blowing."

15 . . Tri-State

Alvin Hotel, Tulsa. "Steel Foundry Practices."

15 . . Birmingham

University of Alabama, Tuscaloosa, Ala. Luncheon and demonstration at the University foundry.

18 . . Northern California

Hotel Shattuck, Berkeley. George E. Miller, sales manager, Machine Div., Federal Foundry Supply Co., Cleveland, "Sand Ramming by Blowing."

18 . . Quad City

Hotel Fort Armstrong, Rock Island, Ill. J. A. Pealer, General Electric Co., Elmira, N. Y., "Pattern Engineering and Co-ordination of Methods to Produce Better Castings."

19 . . Eastern New York

Panetta's Restaurant, Albany. Joint meeting with A.S.M. (host) and A.S.T.E.

20 . . Oregon

Columbia Athletic Club, Portland. George E. Miller, sales manager, Machine Div., Federal Foundry Supply Co., "Sand Ramming by Blowing."

20 . . Central Michigan

Hart Hotel, Battle Creek. L. D. Richardson, Eutectic Welding Alloys Corp., will give speech and live demonstration at Battle Creek Vocational School on "New Developments in Foundry Welding."

21 . . Washington

Everett, Wash. George E. Miller, sales manager, Machine Div., Federal Foundry Supply Co., "Sand Ramming by Blowing."

22 . . Wisconsin

Schroeder Hotel, Milwaukee Sectional Meeting. Speakers on malleable, gray iron, steel, non-ferrous, and pattern.

25 . . Northwestern Pennsylvania

Moose Club, Erie. Annual Meeting. David Ekey, assistant professor, Pennsylvania State University, and A. B. Sinnott, educational director, American Foundrymen's Society, "Foundry Education."

29 . . Chesapeake

Engineers Club of Baltimore, Baltimore, Md. Warner B. Bishop, Archer-Daniels-Midland Co., Cleveland, "The 'D' Process of Shell Molding."

May

2 . . Central Indiana

Athenaeum Turners, Indianapolis. Post Chairmen's Night, L. D. Richardson, Eutectic Welding Alloys Co., "New Developments in Foundry Welding."

2 . . Western Michigan

Bill Stern's, Muskegon. F. S. Brewster, Harry W. Dietert Co., "Sand Practice."

2 . . Central Illinois

American Legion Hall, Peoria. Lester B. Knight, Lester B. Knight & Associates, "Modernization of Foundries."

2 . . Chicago

Chicago Bar Association, Chicago. J. Harry Jackson, Battelle Memorial Institute, "Casting of Titanium and Titanium Alloying."

3 . . Rochester

Hotel Seneca, Rochester. Annual Business Meeting and Election of Officers.

5 . . Saginaw Valley

Fischer's Hotel, Frankenmuth, Mich. Student-Teacher Night. Professor C. C. Sigerfoos, Michigan State College.

7 . . Southern California

Clock Country Club, Whittier, Cal. Annual Ladies Night.

IBF Australian Branch Holds Annual Convention

Second annual convention of the Australian Branch of the Institute of British Foundrymen was held November 10-12 at the Royal Melbourne Technical College in Melbourne. On the program were six technical papers, a technical discussion, a plant visit, and the annual meeting, presidential address, and annual banquet. Representing the American Foundrymen's Society at the annual meeting was Wm. A. Gibson, Gibson Engineering (Sales) Pty. Ltd., Sydney.

The following papers were presented: "Production of Heavy Steel Castings," S. Taylor, Grimethorpe Steel Foundry, English Steel Corp. Ltd. Mr. Taylor described production of steel castings up to 200 tons in weight.

"New Method of Casting Bronze Pump Impellers," W. O. Adams, W. O. & B. Adams Pty. Ltd. Mr. Adams described the use of wax vanes to achieve complex shapes in cement-bonded sand cores for casting pump impellers.

"The Gray Iron Foundry of the Geelong Works, International Harvester Co." W. H. Baxter. The author outlined melting, coremaking, molding, cleaning, and dust collection, as well as control methods for sand and metal.

"Effect of Sodium Additions on the Gas Content of Aluminum-Silicon Alloys," R. H. Dyke, Defense Standards Laboratories. Mr. Dyke described the effect of metallic sodium additions on the amount of gas porosity in sand-cast 13 per cent silicon-aluminum alloys.

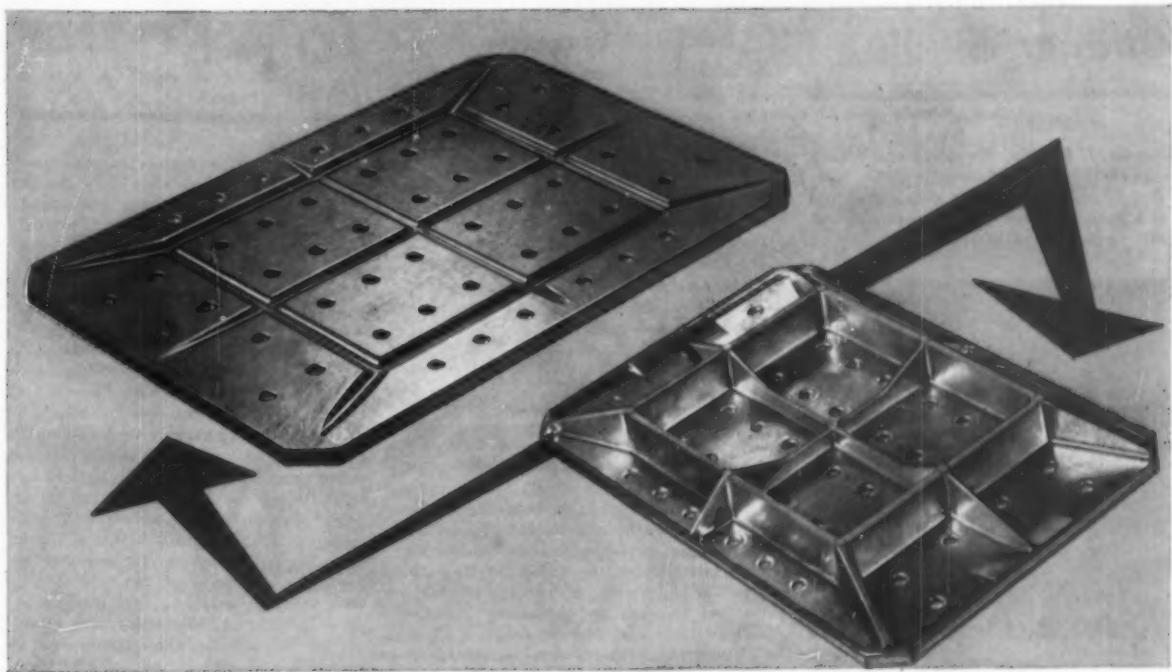
"Foundry Economics," S. G. Harrison. Mr. Harrison outlined organization and planning for sound costing in both production and job shops, emphasizing the importance of knowing costs so sales are made at a profit.

"pH of Molding Sands," P. Markwell, McLean Castings Ltd. The author gave a method of electrometric measurement of pH of foundry materials and gave some typical values for sands and binders.

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OREGON . . W. B. Bishop, Foundry Products Div., Archer-Daniels-Midland Co., speaking at the February meeting.



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Obituaries

Aubrey J. Grindle, President and Chairman of the Board of Grindle Corp., Harvey, Ill., died of a heart attack April 13 at Marion General Hospital, Marion, Ind. Mr. Grindle died after a week's illness.



A. J. Grindle

G. Stamps Gauthier, who with his brother operated the Queen City Foundry, Buffalo, passed away recently after several weeks' illness in a Buffalo hospital.

Ralph Robb Belleville, associated with Dixon Crucible Co., Jersey City, N. J. since 1905, died recently.

Herr Dr. H. C. Ernst Homberger, the honorary president of Georg Fischer Company, Schaffhausen, Switzerland, passed away recently, after serving with the company for 50 years.

Exhibits Manager Leaves

A. A. Hilbron, manager of conventions and exhibits for the American Foundrymen's Society, has returned to the hotel business as assistant director of conventions and exhibits, Morrison Hotel, Chicago. With AFS almost eight years, he devoted most of his time to the biennial exhibit and was known to hundreds of foundry equipment manufacturers and suppliers for his handling of the 1948 AFS Show in Philadelphia, the 1950 and 1954 Shows in Cleveland, and the 1952 Show in Atlantic City.

Health Conference

The 1955 Industrial Health Conference will be held at the Memorial Auditorium, Buffalo, N. Y., April 23-29, 1955.

Groups included in the conference are: Industrial Medical Association, American Conference of Governmental Industrial Hygienists, American Industrial Hygiene Association, American Association of Industrial Dentists and American Association of Industrial Nurses, Inc.

Further information may be obtained by writing the Industrial Health Conference, 28 E. Jackson, Blvd., Chicago.

Society Votes Name Change

American Society of Heating and Ventilating Engineers has voted to change the name of the sixty-year-old engineering society to American Society of Heating and Air-Conditioning Engineers, Inc. The new name, as decided at a special meeting, was filed with the Secretary of State of New York to become effective November 23, 1954.

N.F.A. Holds Detroit Regional Meeting



James I. Poole, Milwaukee labor attorney, spoke on "Crisis Bargaining" at the National Foundry Association Detroit Regional Meeting, January 18. At the speakers table from left to right: Donald Pigott, Consolidated Brass Co., Detroit; C. T. Sheehan, Executive Secretary N.F.A.; J. I. Poole, Fairchild, Foley & Hammond, Milwaukee, guest speaker; C. L. Kronner, Muller Brass Co., Port Huron, Mich.; M. J. Ewald, regional counsel, N.F.A., Detroit, and G. A. Kastner, Lincoln Brass Works, Inc., Detroit.

Abstracts

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tions with the rate of evolution measured. He also demonstrates that since the gas collected contains a large percentage which is combustible, a simple oxide treatment will remove the greater portion of dissolved gases.

55-26 . . "Calcium Carbide Desulphurization by the Injection Process," John A. DeHuff, Air Reduction Co., and Richard Schneidewind, University of Michigan. Discussed are the injection process and the factors to be considered in this application of calcium carbide to desulphurize cast iron. The reaction is rapid and the waste products clear a 500-lb bath quickly. Although desulphurization can be accomplished on low-sulphur metal, the efficiency of the reaction is better at higher melt-in sulphur values. Temperature affects the efficiency of reaction. Multi-stage injection affords a very efficient reagent utilization. Microstructures of desulphurized samples show an increase in matrix ferrite and a trend towards fine, compacted, type-D graphite at low sulphur values.

Calcium carbide injection with nitrogen carrier gas did not change the nitrogen content of induction melted cast irons containing 0.002 to 0.005 per cent. Oxygen showed no correlation with the amount of injected carbide.

55-27 . . "Increasing the Carbon Content of Cast Irons by Ladle Injection," G. E. Spangler, Air Reduction Co., and Richard Schneidewind, University of Michigan. Carbon can be introduced in molten cast iron in a ladle or forehearth by the injection process. Increases of up to one per cent carbon have been made consistently in three minutes or less. Efficiencies of recovery have ranged from 50 to 100 per cent, depending upon the size of the carbon particles used, the purity and physical nature of the carbon, and the temperature at which injection is carried out.

This practice allows additional control of carbon content outside the cupola and permits the use of one base iron which can be altered at will by injection in the ladle to suit any particular casting.

Calcium carbide can be injected simultaneously with carbon if it is desired to desulphurize at the same time.

Iron which have been injected with carbon have a lower chilling tendency than similar composition irons made by usual methods.

55-28 . . "New High Strength Cast Irons Produced by Injection Methods," James W. Estes, Air Reduction Co. and Richard Schneidewind, University of Michigan. Injection of calcium carbide, magnesium oxide, and rare earth oxide, or calcium carbide and rare earth oxide can produce upgraded hypereutectic cast irons with as-cast tensile strengths in the order of 50,000 psi and above. This iron with con-

continued on page 98



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Abstracts

continued from page 96

siderable ductility and unusually low hardness can be considered an intermediate material between gray iron and nodular iron with certain advantages over each. In addition, upgraded iron has high strength, low chill, low solidification shrinkage, and an insensitivity to cooling rate in various section sizes.

55-30 . . "Machinability Testing—Relation between Cutting Temperature and Tool Life for Gray Cast Irons," E. A. Loria,

Carborundum Co., and D. R. Walker, Massachusetts Institute of Technology. Both alloyed and unalloyed gray irons were tested in machining tests designed to show the relationship between tool life, tool temperature, and cutting forces. Tool life was determined by measuring flank wear on carbide tools when machining the surface of individually cast rings of 7 in. ID, 9 in. OD, and $1\frac{1}{2}$ in. thickness at a speed of 315 fpm.

Cutting forces and temperatures generated under the same conditions interrelate the factors governing machinability and may prove to be of value in acceptance testing and quality control of cast irons. Cutting forces and temperatures

have been used successfully as a guide in evaluating tool life on gray irons. Under given operating conditions and with work materials having similar machining properties, this method can be used as a short cut, replacing time and material consuming wear tests.

55-31 . . "Risering of Ductile Cast Iron," Richard A. Flinn and William A. Spindler, University of Michigan and D. J. Reese, Development and Research Dept., International Nickel Co., Inc., (pages 62-66, this issue).

55-32 . . "Nickel Austenitic Ductile Irons," Frederick G. Sefing, Development and Research Div., International Nickel Co., Inc. In presenting the properties of the new group of nickel austenitic ductile irons the author tells of work which showed these irons to have high strength and toughness, with resistance to heat, corrosion, and rubbing wear. In addition they have excellent castability and machinability. Physical properties are markedly higher than those of similar analysis irons of conventional flake graphite.

55-33 . . "Risering of Nodular Iron; Part II—Effect of Silicon Content on Feeding Distance," R. C. Shany and S. L. Gertman, Dept. of Mines and Technical Surveys, Ottawa, Ont., Canada. Continuation of work by these authors which was presented at the 1954 annual convention. The experiment involves determining the feeding distance of various sized risers on $\frac{1}{2}$, 1, and $1\frac{1}{2}$ in. thick semi-circular plates. An iron of lower silicon content (hypoeutectic) was used. This iron showed a feeding distance consistently shorter than hypereutectic irons tested previously.

55-34 . . "Risering of Gray Iron Castings, Report No. 6," E. J. Sullivan, Clyde M. Adams, Jr., and Howard F. Taylor, Massachusetts Institute of Technology. Work on AFS sponsored research project was aimed at confirming data obtained in previous years and at developing improved apparatus. As a result tests on more typical analysis were found to be consistent with earlier findings; theoretical relationships have been greatly simplified. Confirmatory observations are made of the interactions between metal and mold and of the graphite structure of irons as related to shrinkage. Theoretical relationships have been simplified to linear functions of carbon and silicon contents. Primary shrinkage is a function of carbon equivalent but total shrinkage depends more upon total carbon content. The effect of silicon on total shrinkage is less than that predicted theoretically.

55-35 . . "Developments in the Light Castings Industry Including the New Die Pressing Process," R. S. M. Jeffrey, Official Exchange Paper from the Institute of British Foundrymen. Jeffrey recounts developments in small castings manufacture in England, including enamelling, working conditions, technical investigations, and mechanization.

Of special interest is the process of

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For more facts, circle No. 184 p. 17-18

making cast iron drain gutters, half-round, 6 ft long in a mechanized, horizontally-parted permanent mold operation. A measured amount of iron is poured into the female die then displaced into shape by closing the male die just long enough to solidify yet not chill the casting (May issue of *AMERICAN FOUNDRYMAN*).

55-41 . . "Castings in Airframe Design," G. W. Papen, Lockheed Aircraft Corp. The author believes that airframe designers are making optimum use of castings today and that further expansion of this very desirable form of fabrication can only be accomplished by improvement in casting materials and techniques. The paper covers the current use of castings as background material for establishing the criteria required to expand the use of castings in airframe construction. Limitations due to materials and present day casting techniques are explored and defined; definite recommendations are made as to ways and means of expanding the use of castings in aircraft structure.

55-43 . . "A Case Study of a Premium Strength Casting," A. J. Carah, Douglas Aircraft Company, Inc. The development and production experience that allowed a savings of one half the cost of a machined extrusion by replacing it with a sand casting of premium quality is presented. Advantages and disadvantages of the use of castings in missile and aircraft applications are discussed.

55-44 . . "Foundry Characteristics and Properties of Magnesium Sand Casting Alloy HZ32XA," Kenneth E. Nelson, Dow Chemical Co. Production type castings were made of the new magnesium alloy containing 3.0 per cent thorium, 2.1 per cent zinc, and 0.7 per cent zirconium. Castings were inspected in usual way for foundry defects. Heat treated parts were sectioned to obtain a complete picture of tensile properties at room and elevated temperatures. Creep data are reported for 1000-hr tests at elevated temperatures.

Comparison is made with magnesium alloy HK31XA containing 3.0 per cent thorium and 0.7 per cent zirconium. Thorium-containing alloys were found to have a castability inferior to most Mg-Al-Zn alloys and to the Mg-RE-Zn alloys. HK31XA-T6 and HZ32XA-T5 alloys are superior in creep resistance at elevated temperatures to all other commercial magnesium sand casting alloys.

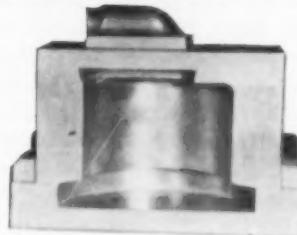
55-47 . . "Application of Insulated Risers to Production of Aluminum Alloy Sand Castings," W. A. Mader, Oberdorfer Foundries, Inc. Author discusses the application of insulated risers to the production of aluminum alloy sand castings. It is shown that riser efficiency can be improved by insulating them to reduce heat losses by conduction and radiation. Examples are shown where the application of insulating riser sleeves provided proper directional solidification and aided in the production of shrink-free aluminum sand castings. The methods of producing permeable gypsum plaster riser sleeves, expanded perlite sleeves, and exothermic sleeves are described. Advantages and disadvantages of each type are discussed.

55-48 . . "Mechanical Properties of Cast Titanium-Silicon Alloys," H. W. Antes and R. E. Edelman, Frankford Arsenal, Pittman-Dunn Laboratories. Ultimate and yield strengths were determined for several castings of titanium-silicon binary alloys from pure titanium to 3.06 per cent silicon. Ultimate tensile strength increased with silicon additions, reaching a maximum of 108,500 psi with 1.8 per cent silicon. Elongation decreased as silicon content increased. The alloys became quite brittle when silicon content exceeded 1.8 per cent. Charpy impact energy was determined over a range of temperatures from -169 F to 212 F for each of the alloys.

55-49 . . "A Quantitative Evaluation and Importance of Sources of Hydrogen in Aluminum Founding," Dexon Chandley, Clyde M. Adams, Jr., and Howard F. Taylor, Massachusetts Institute of Technology. A detailed evaluation of hydrogen adsorption of aluminum alloy 195 under closely controlled operating conditions is described. A reduced pressure tester in combination with a rapid measuring densitometer was used for quantitative evaluation. Sources of hydrogen considered were scrap, furnace atmosphere, air at different humidities, and green sand molds.

The importance of degassing aluminum heats that are to be used for stressed cast-continued on page 100

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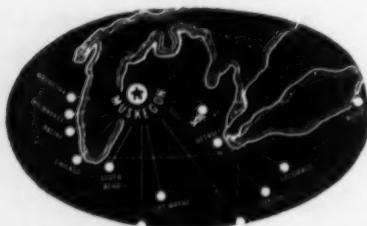


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Abstracts

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ings is brought out in tests. Many types of degassing procedures were used and their relative merit was established under certain operating conditions. It was found that slight changes in degassing technique will produce results that are apparently contradictory.

55-50 . . "The Meaning of the Cast Test Bar in the Evaluation of Aluminum and Magnesium Castings," A. G. Slachta and H. Mansfield, Wright Aeronautical Division. Castings and test bars from the same melt of two alloy systems (Cu-Si-Al alloy AMS 4214 and a rare earth magnesium alloy WAD 6495) were studied at room and elevated temperatures to evaluate the test bar and its true relationship to the casting it represents. Critical variables affecting the physical properties of castings are reviewed.

55-62 . . "Embrittlement, Toughening, and Subcritical Thermal Treatment of Malleable Iron," Gilbert E. Kempka, University of Wisconsin. The effects of phosphorous and subcritical temperature thermal treatments on tensile and impact properties of malleable iron are shown. It was found that malleable irons of many commercial compositions can have their mechanical properties varied appreciably by subcritical treatments. Cooling rate from about 1200 F. is responsible for these property variations. Increased yield and tensile strengths were obtained with rapid cooling from 1200 F. to room temperature. An explanation is offered for the embrittlement phenomena as well as the property variations due to cooling rate from 1200 F.

55-63 . . "Effects of Trace Amounts of Tin, Lead, and Antimony on Annealing of Blackheart Malleable Iron," R. C. Shnay, Dept. of Mines and Technical Surveys, Ottawa, Ont., Canada, and J. E. Wilson and John E. Rehder, Canada Iron Foundries. Tin, lead, and antimony were chosen because they are common, can easily contaminate malleable or cast iron melts through inclusion in purchased scrap, and are seldom determined in routine chemical analysis. Within the concentrations of the investigation, neither tin, lead, nor antimony appear to have an appreciable effect on first stage annealing. Traces of tin and antimony affect the rate of second stage annealing but through different mechanisms.

55-65 . . "Metallurgical Controls for Duplexing Malleable," Lawrence E. Emery, Marion Malleable Iron Works Div., Chicago Railway Equipment Co. Mr. Emery discusses purchasing raw materials on specification and keeping graphitic bearing materials under control. Cupola practice is related to a minimum loss of silicon and manganese. Good pyrometer practice and metal temperature control is covered as is atmosphere control in the air furnace with emphasis on proper selection of metallurgical coal. Use

of fluidity measurement as guide to metal conditions is discussed. Desulphurization is also included. (May issue of **AMERICAN FOUNDRYMAN**).

55-71 . . "Gypsum Cement Molds for Plastic Patterns, Molds, and Dies," Melvin K. Young, United States Gypsum Co. Several plaster molding techniques are presented which are quick, accurate, and inexpensive. Recommendations are offered. Illustrations are of production methods used by many leading pattern shops and tooling plants.

55-74 . . "Casting Precision Patterns in Zircon Molds," John E. Stock and Archie V. Schoville, John Deere Waterloo Tractor Works, (pages 34-37, this issue).

55-73 . . "Research in the Patternmaking Industry," David T. Kindt, Kindt-Collins Co. In discussing the necessity and value of research the author tells of changes in the industry such as plastic patterns, pattern coatings, synthetic glues, and impregnated wood.

55-85 . . "The Effect of Inlet and Outlet Connections Upon Fan Performance," W. E. Tracy, Sturtevant Div., Westinghouse Electric Corp. Because it is impossible to establish accurate engineering data concerning the effect of poor connections without extensive research, this discussion reviews in general terms the "do's" and "don'ts" of fan connection.

55-101 . . "It is Not All Sand," Clyde A. Sanders, American Colloid Co., and Nathan Levinsohn, Minneapolis-Moline Co. The authors illustrate nearly two dozen defective castings and describe the conditions causing the defects. Some may be thought to be caused by sand mixture, molding sand practice, or molding sand control; but most are the result of carelessness of the worker and his supervision.

55-105 . . "Fundamental Principles of the Agglomerating Processes," Carl Ludwig, Bonnot Co. Plasticity, the essence in any agglomerating process, is discussed with respect to the basic role of particle size distribution in synthesizing plasticity. Discussed are packing dynamics and sources of strength. Although liquids or so-called plasticizers cause essential conveniences which help fines gather, they are considered to be over-emphasized because they are so often thought of to be the only cure. Because success is determined by the manner in which the formula is mixed the mixer is singled out as the pivotal item in any agglomerating scheme.

55-107 . . "A Critical Analysis of the Cylindrical Standard Test Specimen for Foundry Sands," Walter Goetz, George Fischer Ltd., Malleable Foundry, Schaffhausen, Switzerland. The author reviews critical remarks for and against the AFS cylindrical test specimen made by European foundrymen and checks these criticisms by testing a sand according to the AFS method. It becomes evident that permeability and strength are the result of a simultaneous change of density and moisture content. The individual influence of moisture and density on permeability and continued on page 102

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strength is represented in a ternary diagram of these properties. The influence of the volume of air space, water, and solid substance in the compacted specimens can also be studied. Permeability and strength are then shown by curves representing constant property values. When permeability and strength are shown as functions of the moisture content, the particular values of these properties apply only for the specific conditions under which the specimen is made.

55-110 . . "General Motors' Experimental Foundry," Louis J. Pedicini, Process Development Section, General Motors Corp. Photographs and story of operations of one of the most modern and spacious of foundry research facilities, (May issue of AMERICAN FOUNDRYMAN).

55-111 . . "Current Status of Test Patterns for the Evaluation of Sand Mixtures," Charles Locke, West Michigan Steel Foundry Co. The use of test castings to guide sand practice and to correlate sand properties has become increasingly popular and has resulted in a multitude of test patterns. The author presents a search of literature for the many test patterns that have been developed; photographs, descriptions, and discussion of tests are included.

55-115 . . "Core Room Practice Pitfalls," Robert H. Greenlee, Auto Specialties Mfg. Co. Shows how most core rooms can produce a better core at reduced costs. Consider the casting rather than core room problems. Obtain dependable sources of raw materials. Determine correct core sand mixes and maintain constant supervision. Use laboratory controls and institute a good scrap program.

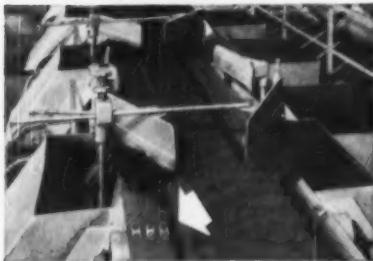
55-121 . . "Bottom-Pour Ladle Practice," A. W. Fastabend, American Steel Foundries, Indiana Harbor Works, (pages 43-45, this issue).

55-122 . . "A Metallographic Study of Ruptures in Steel Castings," J. B. Caine, consultant. A metallographic study of ruptures occurring in steel castings was made as an aid in diagnosing service and processing failures. The results also shed light on the fundamental processes causing ruptures, especially high temperature ruptures.

55-123 . . "High Temperature Impact Properties of Cast Steel," C. F. Christopher, Continental Foundry & Machine Co. Investigation shows that all steels exhibit high temperature brittleness which follows a definite relationship to constitutional composition. The range of hot tearing depends upon the liquidus-solidus relationship which determines the extent of heterogeneous selective freezing. Eliminating or minimizing hot tearing, therefore, depends upon pouring temperature,

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scientific heating and gating, and chilling which eliminates or dissipates stresses.

55-125 . . . "Ladle Practice," Arthur P. Guidi, Texas Electric Steel Casting Co. Described in detail are the preparation and use of one and 5-ton bottom-pour ladles, $3\frac{1}{2}$ -ton teapot ladles, and 275-lb monorail handshank ladles used in the author's foundry. Stopper construction and ladle refractory mix are discussed separately.

55-126 . . . "What Design Engineers are Looking for in Castings," Trevor Davidson, Bucyrus-Erie Co. Author uses his experience in the design of steel castings for relatively small production quantities to outline the difference between foundry costs and the cost of the complete machine to the user. Competitive position of castings is related to other forms of construction. The importance of understanding the designer's problems and of using imagination in developing foundry practices to exploit the ability to produce intricate forms of consistent quality are discussed. (May issue of **AMERICAN FOUNDRYMAN**).

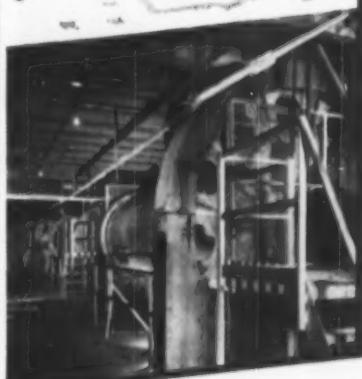
55-130 . . . "Pressure Pouring and Graphite Permanent Molds Used in Production of Steel Car Wheels," Hale H. Hursen, Griffin Wheel Co. Equipment, layout, procedures are disclosed for a method of casting railroad car wheels in graphite molds by forcing molten steel through a tube up into the mold by compressed air. Reasons for using graphite are discussed; the air tight assembly of ladle and mold is illustrated, as are most other features. Design and construction of the pouring tube is treated in detail. Shakeout and cleaning operations are simple. Sand is used only in insulating sleeves for three risers on each wheel.

55-132 . . . "Manufacture of High Quality Pressure Tight Steel Castings," John F. Wallace, Case Institute of Technology. Production of pressure-tight, high-strength castings in static sand molds is feasible and economical when the manufacturing technique is properly controlled. Emphasis is placed on the necessity for obtaining a through-hardened structure for maximum toughness, the selection of chemical composition, and special heat treating techniques. Special molding, melting, gating and risering, and rough machining methods are also discussed. Inspection of castings for mechanical properties and casting defects including magnetic particle and radiographic examination are described. Precautions required in repair welding and the use of pressure tests are covered briefly.

55-135 . . . "The Influence of Molding Materials on the Incidence of Hot Tearing," J. M. Middleton. Experiments were performed to determine the effect on the incidence of hot tearing of variations in quality and type of bonding material and ramming density of molding media; and the range of temperature and time after pouring within and at which hot tearing

continued on page 104

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occurs. Thirty-five lb test castings were used in this work as compared with a 10-lb casting in earlier work.

Temperatures at the skin and in the interior of the larger casting when hot tearing occurred were almost identical to those recorded on the smaller casting but the time after pouring was longer and the load withstood by the casting was greater. When restrained by sand cores bonded with clays very little difference was found in the incidence and the extent of tearing as between the two sizes of test casting. When restrained by sand cores bonded with organic materials the thermal conditions created by the larger casting caused a greater degree of collapse of the organic binders while the steel was in the hot tearing temperature range, reducing the incidence and extent of tearing.

55-136 . . "Feeding Range in Shell Molds," Robert E. Morey, Harold F. Bishop, and William S. Pellini, Naval Research Laboratory. Exact riser feeding ranges in shell molded plate castings were determined for three alloys of eight tested, which developed centerline shrinkage (steel, manganese bronze, and nodular irons). Specialized hydraulic pressure tests have been conducted to determine realistic feeding ranges for bronze and aluminum alloys. It is concluded that the feeding range data obtained for conventional sand mold castings are applicable to shell mold castings.

55-137 . . "Range of Effectiveness of Chills," Victor Paschkis, Columbia University. An investigation of the sufficiency of chill with cast iron chill against a steel slab casting in a sand mold. Results of work can be interpreted for any casting thickness.

55-138 . . "Application of Insufficient Chills," E. C. Troy, Foundry Engineer. The use of insufficient chills to promote controlled solidification by gradient heat extraction is demonstrated to be practical. Steel chills of thickness from 7.5 per cent to 20 per cent of the casting thickness, being 15 to 40 per cent of sufficiency, were arranged to control the solidification rates of a staggered, semi-plate steel casting.

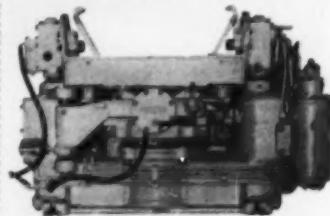
55-141 . . "Your Hidden Fixed Costs and Their Effect on Profit and Loss," Milton E. Annich, American Brake Shoe Co. Discussed is the break-even point for a typical gray iron foundry with a normal production of 150 tons per month. Certain fixed costs, other than those normally considered fixed, are shown to change the break-even point and affect the whole cost structure to such an extent that, if not taken into consideration, they can cause the loss of business. The industrial engineering staff can be employed to develop a realistic estimating and sales policy based on "real costs" and to reduce costs through close control and corrective action.

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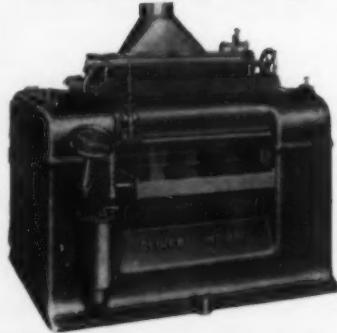
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55-142 . . "Improving Foundry Paper-work," M. E. Mundel, Marquette University. Written communication processes are examined with respect to the design or layout of the physical (format) phase, the way (method) in which each individual job is performed, the path taken by a communication (procedure), and the distribution of work. Reductions in labor time are shown for letter writing, typing, purchase orders, and payroll system operations. The importance of improved communications in transmitting intelligence (operating data) to those with knowledge of operations so that they may make quick and correct decisions of action; and so that decisions may be carried out with greatest efficiency is brought out.

55-143 . . "Production Standards and Their Place in the Foundry Industry," Stuart D. Martin, Central Foundry Div., General Motors Corp. Author tells of a three year intensive effort to establish production standards for over 1000 parts ranging from small brackets to motor blocks cast in several grades of gray iron and two grades of malleable iron at three G.M. foundries.

55-152 . . "Make Plaster Cores in Rubber-Lined Boxes," Robert F. Dalton, Hills-McCanna Co., (pages 46-49, this issue).

55-153 . . "Influence of Vibration on Fluidity and Filling During Investment Casting of an Aluminum Alloy," D. W. Levinson, A. H. Murphy, and W. Roskoker, Armour Research Foundation of Illinois Institute of Technology. The influence of vibration on the apparent fluidity of molten metal was evaluated by studying specially prepared aluminum alloy investment castings. Three aluminum alloys (7 per cent silicon, 4 per cent copper, and 10 per cent magnesium) representing three degrees of suitability for investment castings, were studied.

The ability of molten metal to enter small channels and to flow through small channels was found to be enhanced by using vibration; the intensity of vibration governing the degree of improvement. Results were rationalized in terms of the breakup of impeding surface films.

55-156 . . "Improving Refractory Cost in Malleable Melting," L. E. Emery, Marion Malleable Iron Works. All phases of air furnace refractory practice as conducted at the author's plant are described and discussed in detail.

55-157 . . "Forehearth Refractories for Soda Ash Desulphurizing," Sam F. Carter and Ralph Carlson, American Cast Iron Pipe Co. Service tests were made to determine refractories most resistant to corrosion by soda ash desulphurization. Seven types of brick, eight mortars, and 20 ramming mixes were used in tests to determine the resistance of refractories to corrosion by soda ash desulphurization. Tests were made in a 500-lb forehearth ladle and in a 6-ton forehearth ladle. No material was found best for all conditions; however certain materials were found preferable under circumstances that others were completely unsuitable for.

55-159 . . "A Malleable Furnace Refractory Cost Reduction Program," Fred J. Pfarr and Albert S. Johnson, Lake City Malleable Co. Authors show how a refractory cost reduction program may be set up to prolong refractory life by selecting proper refractory for a specific purpose, and by efficient supervision of unloading, transportation, storage, and handling of refractory, and by melting unit firing schedules.

55-162 . . "Modern Management Control," Roger K. Dailey, Lester B. Knight & Associates, Inc. Explained are management controls provided by current accounting through reporting upon actual

operating cost as compared to the established standards. Monthly statements are described that pin-point all variances from standard, the amount, location, and supervision responsible for such variances. The article also covers product profitability and pricing.

55-165 . . "Improved Casting Quality Through Nondestructive Testing," Francis H. Hohn, Scullin Steel Co. Discussed are the use of x-ray and magnetic particle inspection methods to maintain a high level of casting soundness. The author shows how results of testing are used on quality control charts. (May issue of *AMERICAN FOUNDRYMAN*.)

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HELP WANTED

FOUNDRY ESTIMATING ENGINEER. Steel Foundry requires engineer to prepare cost estimates on inquiries, estimate weights, work as liaison between sales and pattern, molding and finishing departments. Should have knowledge or experience in time study standards, molding and cleaning room practices in steel foundry. Indicate salary required and submit complete resume on experience, education and personal statistics. **Address Box C14, AMERICAN FOUNDRYMAN, Golf and Wolf Roads, Des Plaines, Illinois.**

PROJECT ENGINEER. Specialized gray iron foundry Mid-Ohio city of about 80,000 population. Various non-repetitive production problems including research and development under supervision of Vice-President. Recent graduate foundry option Industrial Engineer with some shop experience. Replies confidential. Write full details personal background, resume of experience, references and salary expected. **Address Box C15, AMERICAN FOUNDRYMAN, Golf and Wolf Roads, Des Plaines, Ill.**

FOUNDRY SALES ENGINEER. Well known steel foundry needs Sales Representative to cover Ohio, Eastern Michigan, Western Pennsylvania. Knowledge of foundry practice desirable. Previous contacts in heavy industry using steel castings helpful. Age 35-40. Degree in Metallurgical or Mechanical useful. Salary and expenses. Submit complete resume, including experience, education and personal statistics. Also submit recent photograph and salary desired. **Address Box C16, AMERICAN FOUNDRYMAN, Golf and Wolf Roads, Des Plaines, Ill.**

MOLDING FOREMAN. A reputable midwest foundry producing high alloy castings has immediate need for a high caliber supervisor. Extensive experience in the molding of high alloy is a prime requisite. Must be meticulous in the supervision of producing extremely high quality molds. **Box C17, AMERICAN FOUNDRYMAN, Golf and Wolf Roads, Des Plaines, Ill.**

CLEANING ROOM FOREMAN. A reputable midwest foundry producing high alloy castings has immediate need for a high caliber supervisor. Extensive experience in all phases of cleaning room operations of high alloy is a prime requisite. Must be meticulous in the supervision of producing extremely high quality castings. **Box C18, AMERICAN FOUNDRYMAN, Golf and Wolf Roads, Des Plaines, Ill.**

METALLURGIST. Experienced in cast iron and foundry practice. Prepared to travel. State salary required and full qualifications. **Box C20, AMERICAN FOUNDRYMAN, Golf and Wolf Roads, Des Plaines, Ill.**

INDUSTRIAL SALESMAN or SALES TRAINEE, age 25-35, for established supplier furnishing basic raw material to the iron and steel industry. Metallurgical education or knowledge of iron and steel melting essential. Territory—Eastern Pennsylvania, New Jersey and Eastern New York. Prefer applicant now living in this area. Salary commensurate with experience plus expenses. **Reply Box C21, advising previous experience, qualifications and salary expected.**

FIRST RATE FOREMAN required for fully mechanized foundry in New Brunswick (Canada). Must have proven production record, knowledge of ferrous and non-ferrous metals, core making and cleaning. Ability to handle men and reduce costs. Excellent opportunity for right man. Full benefits and pension. Write full particulars in strict confidence to **Box C13, AMERICAN FOUNDRYMAN, Golf and Wolf Roads, Des Plaines, Ill.**

Midwestern jobbing foundry producing gray iron castings all sizes, including pit molding, needs well experienced man in green and dry sand to be trained for supervisory position. Excellent opportunity for right man in a well established business which has operated at capacity for over 25 years. Manufacturing facilities again to be expanded. State entire foundry experience. **Reply Box C22, AMERICAN FOUNDRYMAN, Golf and Wolf Roads, Des Plaines, Ill.**

ASSISTANT FOUNDRY SALES MANAGER

A growing, progressive gray iron foundry in northeastern Wisconsin, pouring 150 tons daily, is seeking an aggressive, self-starting assistant foundry sales manager to call on new and established accounts. Must be experienced in foundry techniques, in order to serve customers' best interests at all times.

A permanent career, with opportunities for advancement to a top position is possible for the right man.

In reply, provide complete educational and experience background. Also list references and salary desired. Please do not write unless qualified.

BRILLION IRON WORKS, INC.
Brillion, Wisconsin

FOUNDRY SUPERINTENDENT

Very large Midwest manufacturer is seeking a top foundryman with precision casting experience for position of responsibility. Need not possess degree but should have sound experience in this field. Very attractive opportunity with excellent growth potential. Write:

**BOX C12, AMERICAN FOUNDRYMAN
GOLF AND WOLF ROADS
DES PLAINES, ILL.**

FOR SALE

MOLDING MACHINE. Herman, 6000-lb capacity, jolt, roll, draw, 42 x 78-in. table, 43½-in. draw, in good operating condition, located in Eastern Pennsylvania. A bargain, no dealer involved. **Box C19, AMERICAN FOUNDRYMAN, Golf and Wolf Roads, Des Plaines, Ill.**

FURNACES FOR SALE

10 used Heat Treating Furnaces, and two 1-ton gantry cranes, good condition, priced to sell.

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spar mill bases!

Inside view of base casting by

RIVERSIDE IRON WORKS • Chicago, Illinois

best illustrates the open construction which calls for extreme care and standardization of core technique. Both the interior and the face of this casting are cored. Finish dimensions are: 19 feet long, 34 inches wide, and 36 inches high. The complete spar mill base, when assembled in the aircraft plant, consists of six of these castings in length and two in width.



Side view of some 12-ton base castings shows full 19 ft. expanse with 13 cored openings.



Core assembly close-up of a 6-ton spar mill base similar to the heavier base. Here core molds are assembled and pouring is done on the floor. A slinger is used to run back up sand behind core assembly and along outer edges of the mold.

... or, for that matter, **any** machine tool casting calling for heavy chunk cores . . . and lots of them.

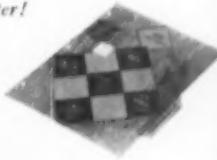
In this case, Riverside Iron Works, Chicago, uses INDUCTOL-mixed cores in producing huge 12-ton base castings for aircraft spar milling machines.

Intricately ribbed and "wide open," these bases are a challenge to craftsman-like core work since **every** set of core molds weighs over 53,000 lbs.

Riverside has always specified INDUCTOL for heavy, yet complicated, castings due to its fast baking time and low gas content. Other benefits are improved collapsibility and added green strength.

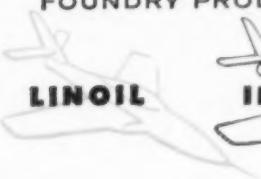
Ask your LINOIL man about INDUCTOL, the core oil that bakes **better** cores . . . **faster**!

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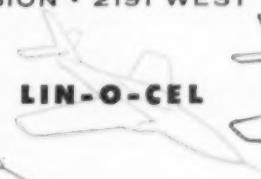
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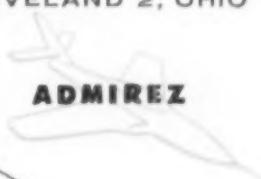
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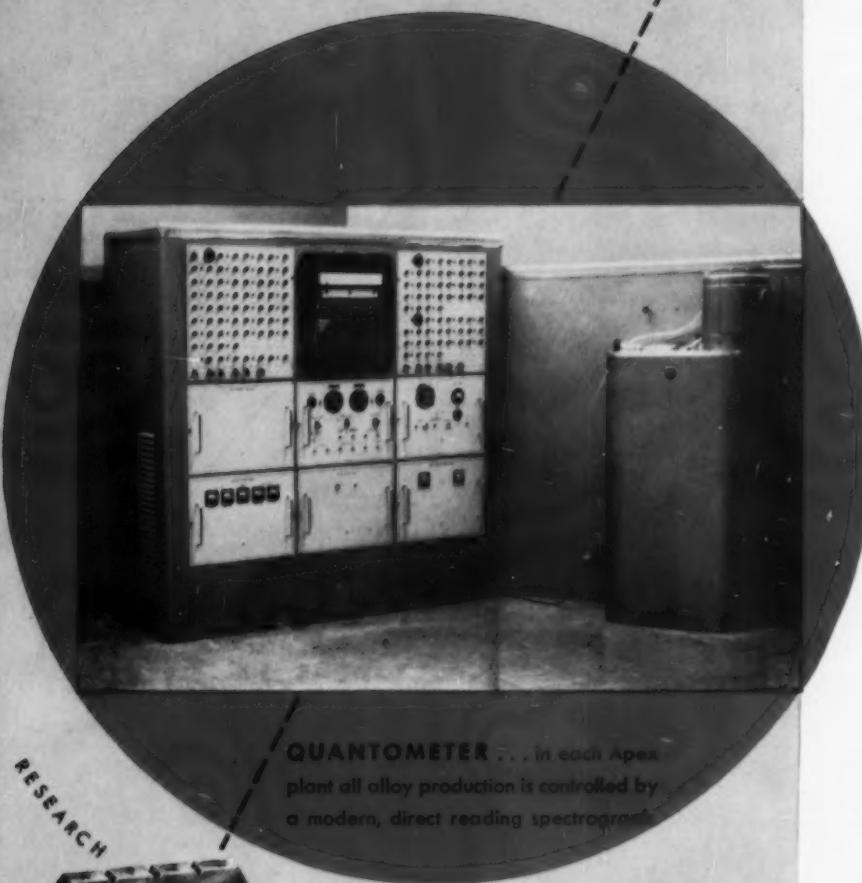
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